Crosswalk for Mathematics
Side to Side Comparison
District of Columbia Standards to Common Core Standards
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Kindergarten				
	DC Math Standards		Common Core Standards	Comments
Number Sense				
Number Sense and Operations	K.NSO-N.1. Count by ones to at least 20.	Number Counting and Cardinality Numbers – Base Ten	K-NCC.5. Count to answer "how many?" questions about as many as 20 things. Objects may be arranged in a line, a rectangular array, a circle, or a scattered configuration. K-NCC.6. Understand that when counting objects, a. The number names are said in the standard order. b. Each object is paired with one and only one number name. c. The last number name said tells the number of objects counted. K-NBT.1. Say the number name sequence to 100.	
Number Sense and Operations	K.NSO-N.2. Represent, name, and order a set of objects (up to 20).	Number Counting and Cardinality Numbers – Base Ten	K-NCC.7. Understand that when counting forward, each successive number name refers to a quantity that is 1 larger. K-NBT.4. Put in order numbers presented in base-ten notation from 1 to 20 (inclusive), and be able to explain the reasoning. K-NBT.5. Count to answer "how many?" questions about as many as 20 things. Objects may be arranged in a line, a rectangular array, a circle, or a scattered configuration. K-NBT.6. Understand that the two digits of a two-digit number represent amounts of tens and ones. In 29, for example, the 2	

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			represents two tens and the 9 represents nine ones.	
Number Sense and Operations	K.NSO-N.3. Match quantities up to at least 10 with numerals and words.	Number Counting and Cardinality	K-NCC.9. Compare and put in order numbers between 1 and 10 presented in written symbols: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.	
Number Sense and Operations	K.NSO-N.4. Compare sets of up to at least 10 concrete objects using appropriate language (e.g., none, more than, fewer than, same number of, one more than).	Number Counting and Cardinality Numbers – Base Ten	K-NCC.8. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. Include groups with up to ten objects. K-NBT.8. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. Include groups with up to ten objects.	
Number Sense and Operations	K.NSO-N.5. Identify positions of objects in sequences (e.g., first, second) up to fifth.			
Number Sense and Operations	K.NSO-N.6. Identify U.S. coins by name and determine their value.			
Number Sense and Operations	K.NSO-F.7. Understand the concepts of whole and half.	Geometry	1-G.5. Decompose circles and rectangles into two and four equal parts. Describe the parts using the words halves, fourths, and quarters, and using the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the parts. Understand that decomposing into more equal shares creates smaller shares.	
Computation				
Number Sense and Operations	K.NSO-C.8. Use objects and drawings to model and solve related addition and subtraction problems to 10.	Numbers – Base Ten	K-NBT.7. Decompose 10 into pairs of numbers, e.g., by using objects or drawings, and record each decomposition with a drawing or equation. K-NBT.8. Compose numbers to make 10, e.g., by using objects or drawings, and record each composition with a drawing or equation.	

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		Numbers - Operations	K-NBT.9. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. K-NOP.1. Understand addition as putting together—e.g., finding the number of objects in a group formed by putting two groups together. Understand subtraction as taking apart—e.g., finding the number of objects left when a one group is taken from another. K-NOP.2. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. Note that drawings need not show details, but should show the mathematics in the problem. (This note also applies wherever drawings are mentioned in subsequent standards.) K-NOP.3. Decompose numbers less than or equal to 10 into pairs in various ways, e.g., using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3). Compose numbers whose sum is less than or equal to 10, e.g., using objects or drawings, and record each composition by a drawing or equation (e.g., 3 + 1 = 4). K-NOP.4. Compose and decompose numbers less than or equal to 10 in two different ways, and record compositions and decompositions by drawings or equations. For example, 7 might be composed or decomposed in two different ways by a drawing showing how a group of 2 and a group of 5 together make the same number as do a group of 3 and a	

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			group of 4. K-NOP.5. Understand that addition and subtraction are related. For example, when a group of 9 is decomposed into a group of 6 and a group of 3, this means not only 9 = 6 + 3 but also 9 – 3 = 6 and 9 – 6 = 3. K-NOP.6. Solve addition and subtraction word problems, and calculate additions and subtractions within 10, e.g., using objects or drawings to represent the problem. K-NOP.7. Fluently add and subtract, for sums and minuends of 5 or less.	
Number Sense and Operations	K.NSO-E.9. Estimate the number of objects in a group and verify results.			
Patterns Relations and Algebra				
Patterns, Relations, and Algebra	K.PRA.1. Identify the attributes of objects as a foundation for sorting and classifying (e.g., a red truck, a red block, and a red ball share the attribute of being red; a square block, a square cracker, and a square book share the attribute of being square).			
Patterns, Relations, and Algebra	K.PRA.2. Sort and classify objects by attributes such as color, shape, size, number, and other properties and explain; identify objects that do not belong to a particular group (e.g., all these objects are red; those are green).	Geometry	K-G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	
Patterns, Relations, and Algebra	K.PRA.3. Identify, reproduce, describe, extend, and create color, rhythmic, shape, number, and letter repeating patterns with simple attributes.			
Patterns, Relations, and Algebra	K.PRA.4. Count by fives and tens up to at least 50.	Number Counting and Cardinality	K-NCC.2. Know the decade words to ninety and recite them in order (“ten, twenty, thirty, …”).	
Geometry				

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Geometry	K.G.1. Name shapes of pattern blocks (e.g., triangle, square, circle).	Geometry	K-G.2. Understand that names of shapes apply regardless of the orientation or overall size of the shape. For example, a square in any orientation is still a square. Students may initially need to physically rotate a shape until it is "level" before they can correctly name it.	
Geometry	K.G.2. Describe attributes of two-dimensional shapes (e.g., number of sides, number of corners, size, roundness); sort these shapes.	Geometry	K-G.3. Understand that shapes can be two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). K-G.4. Understand that shapes can be seen as having parts, such as sides and vertices ("corners"), and that shapes can be put together to compose other shapes. K-G.5. Analyze and compare a variety of two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, component parts (e.g., number of sides and vertices) and other attributes (e.g., having sides of equal length).	
Geometry	K.G.3. Identify and compare three-dimensional shapes (e.g., cube, box, sphere).	Geometry	K-G.3. Understand that shapes can be two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). K-G.5. Analyze and compare a variety of two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, component parts (e.g., number of sides and vertices) and other attributes (e.g., having sides of equal length).	
Geometry	K.G.4. Identify positions of objects in space and use appropriate language (e.g., beside, inside, next to, close to, above, below, apart) to describe and compare their relative positions.	Geometry	K-G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	

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Measurement				
Measurement	K.M.1. Recognize and compare objects with respect to the attributes of length, volume/capacity, weight, area, and time using appropriate language (e.g., longer, taller, shorter, same length; heavier, lighter, same weight; holds more, holds less, holds the same amount).	Measurement and Data	K-MD.1. Understand that objects have measurable attributes, such as length or weight. A single object might have several measurable attributes of interest. K-MD.2. Directly compare two objects with a measurable attribute in common, to see which object has "more of" the attribute. For example, directly compare the heights of two books and identify which book is taller.	
Measurement	K.M.2. Make and use estimates of measurements from everyday experiences.			
Measurement	K.M.3. Use standard and nonstandard units to measure length.	Measurement and Data	1-MD.2. Understand that the length of an object can be expressed numerically by using another object as a length unit (such as a paper-clip, yardstick, or inch length on a ruler). The object to be measured is partitioned into as many equal parts as possible with the same length as the length unit. The length measurement of the object is the number of length units that span it with no gaps or overlaps. For example, "I can put four paperclips end to end along the pencil, so the pencil is four paperclips long." 1-MD.3. Measure the length of an object by using another object as a length unit.	
Measurement	K.M.4. Order events in a day.			
Measurement	K.M.5. Tell time to the nearest hour.	Measurement and Data	1-MD.4. Tell time from analog clocks in hours and half- or quarter-hours.	
Measurement	K.M.6. Identify U.S. coins and their value.			
Data Analysis Statistics and Probability				
Data Analysis, Statistics, and Probability	K.DASP.1. Gather data about self and the environment to answer questions of interest to children; record the results	Measurement and Data	K-MD.3. Classify objects or people into given categories; count the numbers in each category and sort the categories by	

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	using concrete graphs and simple picture graphs to display data.		count. Limit category counts to be less than or equal to 10.	
Data Analysis, Statistics, and Probability	K.DASP.2. Describe relationships displayed in graphs, tables, or other representations (e.g., Which has the most or least number of objects?).			
		Numbers – Base Ten	K-NBT.1. Understand that 10 can be thought of as a bundle of ones—a unit called a "ten."	
		Numbers – Base Ten	K-NBT.2. Understand that a teen number is composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.	
		Numbers – Base Ten	K-NBT.3. Compose and decompose teen numbers into a ten and some ones, e.g., by using objects or drawings, and record the compositions and decompositions in base-ten notation. For example, 10 + 8 = 18 and 14 = 10 + 4.	
		Geometry	K-G.6. Combine two- or three-dimensional shapes to solve problems such as deciding which puzzle piece will fit into a place in a puzzle.	

1st Grade				
	DC Math Standards		Common Core Standards	Comments
Number Sense				
Number Sense and Operations	1.NSO-N.1. Count, read, and write whole numbers to 110 and relate them to the quantities they represent (e.g., knows that 60 is bigger than 20).	Number Counting and Cardinality Numbers – Base Ten	K-NCC.1. Say the number name sequence to 100. 1-NBT.1. Read and write numbers to 100. 1-NBT.2. Starting at any number, count to 100 or beyond. 1-NBT.4. Compare and order two-digit numbers based on meanings of the tens and ones digits, using > and < symbols to record the results of comparisons.	
Number Sense and Operations	1.NSO-N.2. Compare and order whole numbers to 110 by using symbols for less than, equal to, or greater than (<, =, >).	Number Counting and Cardinality Numbers – Base Ten	K-NCC.3. Say the number name sequence forward or backward beginning from a given number within the known sequence (instead of always beginning at 1). 1-NBT.3. Understand that when comparing two-digit numbers, if one number has more tens, it is greater; if the amount of tens is the same in each number, then the number with more ones is greater. 1-NBT.4. Compare and order two-digit numbers based on meanings of the tens and ones digits, using > and < symbols to record the results of comparisons.	
Number Sense and Operations	1. NSO-N.3. Identify the place value of the digits to 110.			
Number Sense and Operations	1.NSO-N.4. Represent equivalent forms of the same number through the use of physical models, diagrams, and number expressions (e.g., 9 may be represented as 4 + 5, 3 + 6, 3 + 3 + 3, 10 – 1, 12 – 3).	Number Counting and Cardinality	K-NCC.8. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. Include groups with up to ten objects.	
Number Sense and Operations	1.NSO-N.5. Identify numbers to 20 as odd or even.			
Number Sense and Operations	1.NSO-N.6. Make combinations of different coins up to 50 cents.			
Fractions				

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Number Sense and Operations	1.NSO-F.7. Model, identify, and represent fractions such as 1/2, 1/3, and 1/4 as parts of wholes (e.g., 1/4 of a pie) and parts of groups.	Geometry	1-G.5. Decompose circles and rectangles into two and four equal parts. Describe the parts using the words halves, fourths, and quarters, and using the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the parts. Understand that decomposing into more equal shares creates smaller shares.	
Computation				
Number Sense and Operations	1.NSO-C.8. Demonstrate the ability to use conventional algorithms for addition and subtraction (two two-digit whole numbers).	Numbers – Base Ten	1-NBT.6. Demonstrate fluency in addition and subtraction within 10. 1-NBT.7. Understand that in adding or subtracting two-digit numbers, one adds or subtracts like units (tens and tens, ones and ones) and sometimes it is necessary to compose or decompose a higher value unit. 1-NBT.10. Explain addition of two-digit numbers using concrete models or drawings to show composition of a ten or a hundred. 1-NBT.11. Add two-digit numbers to two-digit numbers using strategies based on place value, properties of operations, and/or the inverse relationship between addition and subtraction; explain the reasoning used.	
		Numbers - Operations	1-NOP.4. Understand that when all but one of three numbers in an addition or subtraction equation are known, the unknown number can be found. Limit to cases where the unknown number is a whole number. 1-NOP.5. Understand that addition can be recorded by an expression (e.g., 6 + 3), or by an equation that shows the sum (e.g., 6 + 3 = 9). Likewise, subtraction can be recorded by an expression (e.g., 9 – 5), or	

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			by an equation that shows the difference (e.g., 9 – 5 = 4). 1-NOP.7. Solve word problems involving addition and subtraction within 20, e.g., by using objects, drawings and equations to represent the problem. Students should solve problems with unknowns in all positions, and representing these situations with equations that use a symbol for the unknown (e.g., a question mark or a small square). Grade 1 students need not master the more difficult problem types. 1-NOP.8. Solve word problems involving addition of three whole numbers whose sum is less than or equal to 20.	
Number Sense and Operations	1.NSO-C.9. Demonstrate an understanding of various meanings of addition and subtraction, such as addition as combination (i.e., plus, combined with, more), subtraction as comparison (i.e., how much less, how much more), equalizing (i.e., how many more are needed to make these equal), and separation (i.e., how much remaining).	Numbers - Operations	1-NOP.6. Understand that addition and subtraction apply to situations of adding-to, taking-from, putting together, taking apart, and comparing.	
Number Sense and Operations	1.NSO-C.10. Know addition and subtraction facts (addends to 10), commit to memory, and use them to solve problems.	Numbers – Base Ten	1-NBT.5. Calculate mentally, additions and subtractions within 20. 1-NBT.8. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count.	
Number Sense and Operations	1.NSO-C.11. Demonstrate the ability to fluently add and subtract one- and two-digit whole numbers that do not require regrouping.	Numbers – Base Ten	1-NBT.9. Add one-digit numbers to two-digit numbers, and add multiples of 10 to one-digit and two-digit numbers.	
Number Sense and Operations	1.NSO-C.12. Use mental arithmetic to find the sum or difference of two one-digit whole numbers.	Numbers – Base Ten	1-NBT.5. Calculate mentally, additions and subtractions within 20. a. Use strategies that include counting on; making ten (for	

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			example, 7 + 6 = 7 + 3 + 3 = 10 + 3 = 13); and decomposing a number (for example, 17 – 9 = 17 – 7 – 2 = 10 – 2 = 8).	
Number Sense and Operations	1.NSO-C.13. Find the sum of three one-digit whole numbers (e.g., 3 + 4 + 2 =).	Numbers – Base Ten	1-NBT.5. Calculate mentally, additions and subtractions within 20. a. Use strategies that include counting on; making ten (for example, 7 + 6 = 7 + 3 + 3 = 10 + 3 = 13); and decomposing a number (for example, 17 – 9 = 17 – 7 – 2 = 10 – 2 = 8).	
Number Sense and Operations	1.NSO-C.14. Identify one more than, one less than, 10 more than, and 10 less than for any number up to 100.	Numbers – Base Ten	1-NBT.8. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count. 1-NBT.9. Add one-digit numbers to two-digit numbers, and add multiples of 10 to one-digit and two-digit numbers.	
Number Sense and Operations	1.NSO-C.15. Understand and use the inverse relationship between addition and subtraction (e.g., 8 + 6 = 14 is equivalent to 14 – 6 = 8 and is also equivalent to 14 – 8 = 6) to solve problems and check solutions.	Numbers - Operations	1-NOP.3. Understand that addition and subtraction have an inverse relationship. For example, if 8 + 2 = 10 is known, then 10 – 2 = 8 and 10 – 8 = 2 are also known.	
Number Sense and Operations	1.NSO-C.16. Know the meaning of “two times something” or “three times something” as an addition (e.g., two times seven means 7 + 7).			
Patterns Relations and Algebra				
Patterns, Relations, and Algebra	1.PRA.1. Identify, reproduce, describe, extend, and create simple rhythmic, shape, size, number, color, and letter repeating patterns.			
Patterns, Relations, and Algebra	1.PRA.2. Describe and create arithmetic progressions (e.g., 1, 4, 7, 10 . . . or 25, 23, 21 . . .).			
Patterns, Relations, and Algebra	1.PRA.3. Identify arithmetic progressions on the hundreds chart.			

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Patterns, Relations, and Algebra	1.PRA.4. Skip count forward and backward by twos, fives, and tens up to at least 50, starting at any number and using appropriate aids (e.g., hundreds chart, number line).	Numbers – Base Ten	2-NBT.3. Count within 1000; skip count by 2s, 5s, 10s, and 100s.	
Patterns, Relations, and Algebra	1.PRA.5. Write and solve number sentences from problem situations that express relationships involving addition and subtraction, including +, –, <, >, =.	Numbers – Base Ten	1-NBT.7. Solve word problems involving addition and subtraction within 20, e.g., by using objects, drawings and equations to represent the problem. Students should solve problems with unknowns in all positions, and representing these situations with equations that use a symbol for the unknown (e.g., a question mark or a small square). Grade 1 students need not master the more difficult problem types. 1-NBT,8. Solve word problems involving addition of three whole numbers whose sum is less than or equal to 20.	
Patterns, Relations, and Algebra	1.PRA.6. Apply knowledge of fact families to solve simple open sentences for addition and subtraction that have variables (e.g., □ + 2 = 7 and 10 - □ =6).	Numbers - Operations	K-NOP.3. Decompose numbers less than or equal to 10 into pairs in various ways, e.g., using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3). Compose numbers whose sum is less than or equal to 10, e.g., using objects or drawings, and record each composition by a drawing or equation (e.g., 3 + 1 = 4).	
Geometry				
Geometry	1.G.1. Describe attributes and parts of two- and three-dimensional shapes (e.g., length of sides and number of corners, edges, faces, and sides).	Geometry	1-.G.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size) for a wide variety of shapes. 1-G.4. Compose three-dimensional shapes to create a unit, using concrete models of cubes, right rectangular prisms, right circular cones, and right circular cylinders. Form new shapes by repeating the unit.	

1st Grade				
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			Students do not need to learn formal names such as “right rectangular prism.”	
Geometry	1.G.2. Identify congruent shapes.			
Geometry	1.G.3. Identify symmetry in two-dimensional shapes.	Geometry	1-G.6. Decompose two-dimensional shapes into rectangles, squares, triangles, half-circles, and quarter-circles, including decompositions into equal shares.	
Geometry	1.G.4. Combine shapes and take them apart to make other shapes (e.g., two congruent right triangles can be arranged to form a rectangle).	Geometry	1-G.2. Understand that shapes can be joined together (composed) to form a larger shape or taken apart (decomposed) into a collection of smaller shapes. Composing multiple copies of some shapes creates tilings. In this grade, “circles,” “rectangles,” and other shapes include their interiors as well as their boundaries. 1-G.3. Compose two-dimensional shapes to create a unit, using cutouts of rectangles, squares, triangles, half-circles, and quarter-circles. Form new shapes by repeating the unit.	
Geometry	1.G.5. Arrange and describe objects in space by proximity, position, and direction (e.g., near, far, below, above, up, down, behind, in front of, next to, left or right of).	Geometry	K-G3.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	
Measurement				
Measurement	1.M.1. Compare the length, weight, and volume of two or more objects by using direct comparison.	Measurement and Data	1-MD.1. Order three objects by length; compare the length of two objects indirectly by using a third object.	
Measurement	1.M.2. Make and use estimates of measurement, including time and weight.	Measurement and Data	1-MD.4. Tell time from analog clocks in hours and half- or quarter-hours.	
Measurement	1.M.3. Measure the length of objects by repeating a nonstandard or standard unit.	Measurement and Data	1-MD.2. Understand that the length of an object can be expressed numerically by using another object as a length unit (such as a paper-clip, yardstick, or inch length on a ruler). The object to be measured is partitioned into as many equal parts as	

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			possible with the same length as the length unit. The length measurement of the object is the number of length units that span it with no gaps or overlaps. For example, "I can put four paperclips end to end along the pencil, so the pencil is four paperclips long." 1-MD.3. Measure the length of an object by using another object as a length unit.	
Measurement	1.M.4. Tell time at half-hour intervals on analog and digital clocks using a.m. and p.m., and relate time to events (e.g., before/after, shorter/longer).	Measurement and Data	1-MD.4. Tell time from analog clocks in hours and half- or quarter-hours.	
Measurement	1.M.5. Make combinations of coins up to 50 cents.			
Data Analysis Statistics and Probability				
Data Analysis, Statistics, and Probability	1.DASP.1. Use surveys and observations to gather data about themselves and their surroundings (e.g., What is your favorite dessert?).			
Data Analysis, Statistics, and Probability	1.DASP.2. Represent and compare data (e.g., largest, smallest, most often, least often) using tally charts, pictures, and bar graphs.	Measurement and Data	1-MD.5. Organize, represent, and interpret data with several categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	
Data Analysis, Statistics, and Probability	1.DASP.3. Ask and answer simple questions related to data representations (e.g., Who is the tallest student in the class? What is the favorite fruit of the class?).			
		Numbers - Operations	1-NOP.1. Understand the properties of addition. a. Addition is commutative. For example, if 3 cups are added to a stack of 8 cups, then the total number of cups is the same as when 8 cups are added to a stack of 3 cups; that is, 8 + 3 = 3 + 8.	

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			b. Addition is associative. For example, 4 + 3 + 2 can be found by first adding 4 + 3 = 7 then adding 7 + 2 = 9, or by first adding 3 + 2 = 5 then adding 4 + 5 = 9. c. 0 is the additive identity.	
		Numbers - Operations	1-NOP. 2. Explain and justify properties of addition and subtraction, e.g., by using representations such as objects, drawings, and story contexts. Explain what happens when: a. The order of addends in a sum is changed in a sum with two addends. b. 0 is added to a number. c. A number is subtracted from itself. d. One addend in a sum is increased by 1 and the other addend is decreased by 1. Limit to two addends.	

2nd Grade				
	DC Math Standards		Common Core Standards	Comments
Number Sense				
Number Sense and Operations	2. NSO-N.1. Count, read, and write whole numbers to 1,000 and relate them to the quantities they represent.	Numbers – Base Ten	2-NBT.1. Understand that 100 can be thought of as a bundle of tens—a unit called a "hundred."	
Number Sense and Operations	2.NSO-N.2. Compare and order numbers to 1,000; use the symbols >, <, =.	Numbers – Base Ten	2-NBT.4. Understand that when comparing three-digit numbers, if one number has more hundreds, it is greater; if the amount of hundreds is the same in each number, then the number with more tens is greater. If the amount of tens and hundreds is the same in each number, then the number with more ones is greater. 2-NBT.5. Compare and order three-digit numbers based on meanings of the hundreds, tens, and ones digits.	
Number Sense and Operations	2.NSO-N.3. Identify the place value of the digits to 1,000.	Numbers – Base Ten	2-NBT.4. Understand that when comparing three-digit numbers, if one number has more hundreds, it is greater; if the amount of hundreds is the same in each number, then the number with more tens is greater. If the amount of tens and hundreds is the same in each number, then the number with more ones is greater. 2-NBT.8. Understand that in adding or subtracting three-digit numbers, one adds or subtracts like units (hundreds and hundreds, tens and tens, ones and ones) and sometimes it is necessary to compose or decompose a higher value unit.	
Number Sense and Operations	2.NSO-N.4. Use words, models, and expanded forms (e.g., 35 = 3 tens + 5 ones) to represent numbers to 1,000.	Numbers - Operations	2-NOP.2. Read and write numbers to 1000 using base-ten notation, number names, and expanded form.	
Number Sense and Operations	2.NSO-N.5. Know that even numbers end in 0, 2, 4, 6, or 8; recognize even			

2nd Grade				
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	numbers as multiples of two; know that odd numbers end in 1, 3, 5, 7, or 9.			
Number Sense and Operations	2.NSO-N.6. Identify the value of all U.S. coins and $1, $5, $10, and $20 bills. Find the value of a collection of coins and dollar bills and different ways to represent an amount of money up to $5.	Numbers – Base Ten	2-NBT.3. Count within 1000; skip count by 2s, 5s, 10s, and 100s.	
Fractions				
Number Sense and Operations	2.NSO-F.7. Know that fractions may represent a portion of a whole that has been partitioned into parts of equal area or length; use the terms "numerator" and "denominator."	Geometry Fractions	1-G.5. Decompose circles and rectangles into two and four equal parts. Describe the parts using the words halves, fourths, and quarters, and using the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the parts. Understand that decomposing into more equal shares creates smaller shares. 2-G.6. Decompose circular and rectangular objects into two, three, or four equal parts. Describe the parts using the words halves, thirds, half of, a third of, etc.; describe the wholes as two halves, three thirds, four fourths. Recognize that a half, a third, or a fourth of a circular or rectangular object—a graham cracker, for example—is the same size regardless of its shape. 3-NF.5. Understand that fractions apply to situations where a whole is decomposed into equal parts; use fractions to describe parts of wholes. For example, to show 1/3 of a length, decompose the length into 3 equal parts and show one of the parts.	
Number Sense and Operations	2.NSO-F.8. Recognize the inverse relationship between the size of a unit fraction and the size of the denominator (e.g., 1/4 < 1/3).	Fractions	3-NF.2. Understand that fractions are built from unit fractions. For example, 5/4 represents the point on a number line obtained by marking off five lengths of ¼ to the right of 0. 3-NF.6. Compare and order fractional quantities with equal numerators or equal denominators, using the fractions	

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			themselves, tape diagrams, number line representations, and area models. Use > and < symbols to record the results of comparisons.	
Number Sense and Operations	2.NSO-F.9. Recognize, name, and write commonly used fractions such as 1/2, 2/3, and 3/4.	Fractions	3-NF.1. Understand that a unit fraction corresponds to a point on a number line. For example, 1/3 represents the point obtained by decomposing the interval from 0 to 1 into three equal parts and taking the right-hand endpoint of the first part. In Grade 3, all number lines begin with zero.	
Number Sense and Operations	2.NSO-F.10. Recognize that fractions such as 2/2, 3/3, 4/4, 10/10, and 100/100 are equal to the whole and to one.	Fractions	3-NF.4. Understand that whole numbers can be expressed as fractions. Three important cases are illustrated by the examples 1 = 4/4, 6 = 6/1, and 7 = (4 x 7)/4. Expressing whole numbers as fractions can be useful for solving problems or making calculations.	
Computation				
Number Sense and Operations	2.NSO-C.11. Demonstrate the ability to use conventional algorithms for addition (two three-digit whole numbers and three two-digit whole numbers) and subtraction (two three-digit whole numbers).	Numbers - Operations	2-NOP.1. Explain and justify properties of addition and subtraction, e.g., by using representations such as objects, drawings, and story contexts. Include properties such as: a. Changing the order of addends does not change their sum. b. Subtracting one addend from a sum of two numbers results in the other addend. c. If more is subtracted from a number, the difference is decreased, and if less is subtracted the difference is increased. d. In an addition equation, each addend can be decomposed and the parts can be recombined in any order without changing the	

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			sum. For example, 5 + 3 = 8. Because 5 decomposes as 4 + 1, the first addend can be replaced by 4 + 1, yielding (4 + 1) + 3 = 8. Recombining in two different orders: 4 + 4 = 8, also 7 + 1 = 8.	
Number Sense and Operations	2.NSO-C.12. Find the distance between numbers on the number line (e.g., how far is 76 from 24).	Fractions	3-NF.1. Understand that a number line has an origin (0) and a unit (1), with whole numbers one unit distance apart. Use number lines to represent problems involving distances, elapsed time, amounts of money and other quantities. In such problems, the interval from 0 to 1 may represent a unit of distance, time, money, etc.	
Number Sense and Operations	2.NSO-C.13. Know addition and subtraction facts (addends to 12), commit to memory, and use them to solve problems. Select and use appropriate operations (addition and subtraction) to solve problems, including those involving money.	Numbers - Operations Numbers – Base Ten	2-NOP.2. Solve word problems involving addition and subtraction within 100, e.g., by using drawings or equations to represent the problem. Students should work with all of the addition and subtraction situations shown in the Glossary, Table 1, solving problems with unknown sums, addends, differences, minuends, and subtrahends, and representing these situations with equations that use a symbol for the unknown (e.g., a question mark or a small square). Focus on the more difficult problem types. 2-NOP.3. Solve two-step word problems involving addition and subtraction within 100, e.g., by using drawings or equations to represent the problem. 2-NBT.6. Fluently add and subtract within 20. By end of Grade 2, know from memory sums of one-digit numbers.	
Number Sense and Operations	2.NSO-C.14. Demonstrate the ability to add and subtract three-digit whole	Numbers – Base Ten	2-NBT.9. Given a number from 100 to 900, mentally find 10 more or 10 less than the	

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	numbers accurately and efficiently.		number, and mentally find 100 more or 100 less than the number, without counting. 2-NBT.11. Compute sums and differences of one-, two-, and three-digit numbers using strategies based on place value, properties of operations, and/or the inverse relationship between addition and subtraction; explain the reasoning used. 2-NBT.13. Compute sums of two three-digit numbers, and compute sums of three or four two-digit numbers, using the standard algorithm; compute differences of two three-digit numbers using the standard algorithm.	
Number Sense and Operations	2.NSO-C.15. Use mental arithmetic to find the sum or difference of two two-digit numbers.	Numbers – Base Ten	2-NBT.7. Mentally compute sums and differences of multiples of 10. For example, mentally calculate 130 – 80.	
Number Sense and Operations	2.NSO-C.16. Represent multiplication as repeated addition	Numbers - Operations	3-NOP.1. Understand that multiplication of whole numbers is repeated addition. For example, 5 x 7 means 7 added to itself 5 times. Products can be represented by rectangular arrays, with one factor the number of rows and the other the number of columns.	
Number Sense and Operations	2.NSO-C.17. Demonstrate proficiency with multiplication facts for the ones, twos, and fives.	Numbers – Base Ten	3-NBT.9. Use a variety of strategies for multiplication and division within 100. By end of Grade 3, know from memory products of one-digit numbers where one of the factors is 2, 3, 4, or 5.	
Number Sense and Operations	2.NSO-C.18. Demonstrate an understanding of the inverse relationship of addition and subtraction, and use that understanding to simplify computation and check solutions.	Numbers – Base Ten	2-NBT.11. Compute sums and differences of one-, two-, and three-digit numbers using strategies based on place value, properties of operations, and/or the inverse relationship between addition and subtraction; explain the reasoning used.	
Number Sense and Operations	2.NSO-C.19. Know and identify various meanings of addition and subtraction,	Numbers – Base Ten	2-NBT.12. Explain why addition and subtraction strategies and algorithms	

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	such as addition as combination (i.e., plus, combined with, more), subtraction as comparison (i.e., how much less, how much more), equalizing (i.e., how many more are needed to make these equal), and separation (i.e., how much remaining).		work, using place value and the properties of operations. Include explanations supported by drawings or objects. A range of reasonably efficient algorithms may be covered, not only the standard algorithm.	
Estimation				
Number Sense and Operations	2.NSO-E.20. Estimate, calculate, and solve problems involving addition and subtraction of two-digit numbers. Describe differences between estimates and actual calculations	Numbers – Base Ten	1-NBT.6. Demonstrate fluency in addition and subtraction within 10. 1-NBT.7. Understand that in adding or subtracting two-digit numbers, one adds or subtracts like units (tens and tens, ones and ones) and sometimes it is necessary to compose or decompose a higher value unit. 1-NBT.8. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count. 1-NBT.9. Add one-digit numbers to two-digit numbers, and add multiples of 10 to one-digit and two-digit numbers. 1-NBT.10. Explain addition of two-digit numbers using concrete models or drawings to show composition of a ten or a hundred. 1-NBT.11. Add two-digit numbers to two-digit numbers using strategies based on place value, properties of operations, and/or the inverse relationship between addition and subtraction; explain the reasoning used.	
Patterns Relations and Algebra				
Patterns, Relations, and Algebra	2.PRA.1. Recognize and describe simple repeating and growing patterns using numbers, shapes, sizes, colors, and letters.			
Patterns,	2.PRA.2. Describe functions related to			

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Relations, and Algebra	coin trades and measurement trades (e.g., 5 pennies make 1 nickel; 4 cups make 1 quart).			
Patterns, Relations, and Algebra	2.PRA.3. Skip count forward and backward by twos, fives, and tens up to at least 100, starting at any number.	Numbers – Base Ten	2-NBT.3. Count within 1000; skip count by 2s, 5s, 10s, and 100s.	
Patterns, Relations, and Algebra	2.PRA.4. Construct and solve open sentences with variables for addition and subtraction of up to two three-digit numbers (e.g., 42 + □ = 292).	Numbers – Base Ten	2-NBT.10. Understand that algorithms are predefined steps that give the correct result in every case, while strategies are purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another. For example, one might mentally compute 503 – 398 as follows: 398 + 2 = 400, 400 + 100 = 500, 500 + 3 = 503, so the answer is 2 + 100 + 3, or 105. 2.NBT.11. Compute sums and differences of one-, two-, and three-digit numbers using strategies based on place value, properties of operations, and/or the inverse relationship between addition and subtraction; explain the reasoning used.	
Patterns, Relations, and Algebra	2.PRA.5. Use the commutative and associative rules for addition to simplify mental calculations and to check results.	Numbers – Base Ten	2-NBT.10. Understand that algorithms are predefined steps that give the correct result in every case, while strategies are purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another. For example, one might mentally compute 503 – 398 as follows: 398 + 2 = 400, 400 + 100 = 500, 500 + 3 = 503, so the answer is 2 + 100 + 3, or 105.	
Geometry				
Geometry	2.G.1. Identify, describe, draw, and compare two-dimensional shapes, including both polygonal (up to six sides) and curved figures such as circles.	Geometry	2-G.2. Identify and name polygons of up to six sides by the number of their sides or angles. 2-G.3. Recognize rectangles, rhombuses,	

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			squares and trapezoids as examples of quadrilaterals; draw examples of quadrilaterals that do not belong to any of these subcategories. 2-G.5. Recognize objects as resembling spheres, right circular cylinders, and right rectangular prisms. Students do not need to learn formal names such as "right rectangular prism."	
Geometry	2.G.2. Classify familiar two- and three-dimensional shapes by common attributes such as shape of curved and straight lines, number and shape of faces, edges, and vertices.	Geometry	2-G.1. Understand that different categories of shapes (e.g., rhombuses, trapezoids, rectangles, and others) can be united into a larger category (e.g., quadrilaterals) on the basis of shared attributes (e.g., having four straight sides).	
Geometry	2.G.3. Match and construct congruent (e.g., two triangles that are the same shape and size) and symmetric shapes (e.g., two halves of a heart divided down the center line).	Geometry	2-G.4. Draw and identify shapes that have specific attributes, such as number of equal sides or number of equal angles. Sizes of lengths and angles are compared directly or visually, not compared by measuring. 2-G.6. Decompose circular and rectangular objects into two, three, or four equal parts. Describe the parts using the words halves, thirds, half of, a third of, etc.; describe the wholes as two halves, three thirds, four fourths. Recognize that a half, a third, or a fourth of a circular or rectangular object—a graham cracker, for example—is the same size regardless of its shape.	
Geometry	2.G.4. Identify shapes under rotation (turns), reflections (flips), translation (slides), and enlargement. Describe direction of translations (e.g., left, right, up, down).			
Geometry	2.G.5. Predict and explain the results of putting two-dimensional shapes together and taking them apart (e.g.,	Geometry	1-G.2. Understand that shapes can be joined together (composed) to form a larger shape or taken apart (decomposed)	

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	two congruent right triangular shapes form a rectangle).		into a collection of smaller shapes. Composing multiple copies of some shapes creates tilings. In this grade, "circles," "rectangles," and other shapes include their interiors as well as their boundaries. 1-G.5. Decompose circles and rectangles into two and four equal parts. Describe the parts using the words halves, fourths, and quarters, and using the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the parts. Understand that decomposing into more equal shares creates smaller shares. 1-G.6. Decompose two-dimensional shapes into rectangles, squares, triangles, half-circles, and quarter-circles, including decompositions into equal shares.	
Geometry	2.G.6. Relate geometric ideas to numbers (e.g., seeing rows in an array as a model of repeated addition).	Geometry	1-G.4. Compose three-dimensional shapes to create a unit, using concrete models of cubes, right rectangular prisms, right circular cones, and right circular cylinders. Form new shapes by repeating the unit. Students do not need to learn formal names such as "right rectangular prism."	
Measurement				
Measurement	2.M.1. Measure and compare the length of common objects using metric and U.S. customary units to the nearest centimeter or inch.	Measurement and Data	2-MD.2. Measure lengths using measurement tools such as rulers, yardsticks and measuring tapes; understand that these tools are used to find out how many standard length units span an object with no gaps or overlaps, when the 0 mark of the tool is aligned with an end of the object. 2-MD.5. Understand that lengths can be compared by placing objects side by side, with one end lined up. The difference in lengths is how far the longer extends beyond the end of the shorter. 2-MD.6. Understand that a sum of two	

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			whole numbers can represent a combination of two lengths; a difference of two whole numbers can represent a difference in length; find total lengths and differences in lengths using addition and subtraction.	
Measurement	2.M.2. Make and use estimates of measurement including time, volume, weight, area, and perimeter.	Measurement and Data	2-MD.7. Find time intervals between hours in one day. 3-MD.3. Understand and use concepts of area measurement. a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. b. A plane figure which can be covered without gaps or overlaps by n unit squares has an area of n square units. Areas of some other figures can be measured by using fractions of unit squares or using figures whose areas have been found by decomposing other figures. c. When measuring an area, if a smaller unit of measurement is used, more units must be iterated to measure the area in those units. d. Determine and compare areas by counting square units. Use cm^2, m^2, in^2, ft^2, and improvised units. 3-MD.4. Understand that multiplication of whole numbers can be represented by area models; a rectangular region that is a length units by b length units (where a and b are whole numbers) and tiled with unit squares illustrates why the rectangle	

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			encloses an area of a x b square units. 3-MD.5. Solve problems involving perimeters of polygons. a. Add given side lengths, and multiply for the case of equal side lengths. b. Find an unknown length of a side in a polygon given the perimeter and all other side lengths; represent these problems with equations involving a letter for the unknown quantity. c. Exhibit rectangles with the same perimeter and different area, and with the same area and different perimeter.	
Measurement	2.M.3. Select and correctly use the appropriate measurement tool (ruler, balance scale, thermometer).	Measurement and Data	2-MD.2. Measure lengths using measurement tools such as rulers, yardsticks and measuring tapes; understand that these tools are used to find out how many standard length units span an object with no gaps or overlaps, when the 0 mark of the tool is aligned with an end of the object.	
Measurement	2.M.4. Tell time at quarter-hour intervals.	Measurement and Data	1-MD.4. Tell time from analog clocks in hours and half- or quarter-hours. 2-MD.7. Find time intervals between hours in one day.	
Measurement	2.M.5. Identify parts of the day (e.g., morning, afternoon, evening), days of the week, and months of the year. Identify dates using a calendar.	Measurement and Data	2-MD.7. Find time intervals between hours in one day.	
Measurement	2.M.6. Identify the value of all U.S. coins and $1, $5, $10, and $20 bills. Find the value of a collection of coins and bills and different ways to represent an	Measurement and Data	2-MD.8. Solve word problems involving dollar bills, quarters, dimes, nickels and pennies. Do not include dollars and cents in the same problem.	

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	amount of money up to $5 using appropriate notation.			
Data Analysis Statistics and Probability				
Data Analysis, Statistics, and Probability	2.DASP.1. Use interviews, surveys, and observations to gather data about themselves and their surroundings.	Measurement and Data	1-MD.5. Organize, represent, and interpret data with several categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	
Data Analysis, Statistics, and Probability	2.DASP.2. Organize, classify, and represent data using tallies, charts, tables, bar graphs, pictographs, and Venn diagrams; interpret the representations.	Measurement and Data	2-MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with several categories. Connect representations on bar graph scales, rulers, and number lines that begin with zero. Solve simple Put Together/Take Apart and Compare problems using information presented in a bar graph. 3-MD.7. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a dot plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	
Data Analysis, Statistics, and Probability	2.DASP.3. Formulate inferences (draw conclusions) and make educated guesses (conjectures) about a situation based on information gained from data.	Measurement and Data	2-MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with several categories. Connect representations on bar graph scales, rulers, and number lines that begin with zero. Solve simple Put Together/Take Apart and Compare problems using information presented in a bar graph. See Glossary, Table 1.	
		Measurement and Data	2-MD.1. Understand that 1 inch, 1 foot, 1 centimeter, and 1 meter are conventionally defined lengths used as standard units.	
		Measurement and Data	2-MD.3. Understand that when measuring a length, if a smaller unit is used, more	

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			copies of that unit are needed to measure the length than would be necessary if a larger unit were used.	
		Measurement and Data	2-MD.4. Understand that units can be decomposed into smaller units, e.g., 1 foot can be decomposed into 12 inches and 1 meter can be decomposed into 100 centimeters. A small number of long units might compose a greater length than a large number of small units.	
		Measurement and Data	2-MD.9. Generate measurement data by measuring whole-unit lengths of several objects, or by making repeated measurements of the same object. Show the measurements by making a dot plot, where the horizontal scale is marked off in whole-number units.	

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Number Sense				
Number Sense and Operations	3.NSO-N.1. Exhibit an understanding of the base 10 number system by reading, modeling, and writing whole numbers to at least 10,000; demonstrate an understanding of the values of the digits.	Numbers – Base Ten	3-NBT.1. Understand that 1000 can be thought of as a bundle of hundreds—a unit called a "thousand." 3-NBT.2. Read and write numbers to 10,000 using base-ten notation, number names, and expanded form. 3-NBT.4. Understand that when comparing four-digit numbers, if one number has more thousands, it is greater; if the amount of thousands is the same in each number, then the number with more hundreds is greater; and so on. Compare and order four-digit numbers based on meanings of the digits.	
Number Sense and Operations	3.NSO-N.2. Represent, compare, and order numbers to 10,000 using various forms, including expanded notation (e.g., 3,206 = 3 x 1,000 + 2 x 100 + 6) and written out in words (e.g., three thousand two-hundred six).	Numbers – Base Ten	3-NBT.2. Read and write numbers to 10,000 using base-ten notation, number names, and expanded form.	
Number Sense and Operations	3.NSO-N.3. Round whole numbers through 10,000 to the nearest 10, 100, and 1,000.	Numbers – Base Ten	3-NBT.3. Count within 10,000; skip count by 10s, 100s and 1000s.	
Number Sense and Operations	3.NSO-N.4. Recognize sets to which a number may belong (odd numbers, even numbers, and multiples of numbers through 10). Identify the numbers in those classes (e.g., the class of multiples of 7 between 1 and 29 consists of 7, 14, 21, 28			
Fractions				
Number Sense and Operations	3.NSO-F.5. Identify and represent fractions (between 0 and 1 with denominators through 10) as parts of unit wholes and parts of a collection.	Fractions	3-NF.1. Understand that a unit fraction corresponds to a point on a number line. For example, 1/3 represents the point obtained by decomposing the interval from 0 to 1 into three equal parts and taking the right-hand endpoint of the first	

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			part. In Grade 3, all number lines begin with zero.	
Number Sense and Operations	3.NSO-F.6. Recognize, name, and use equivalent fractions with denominators 2, 3, 4, and 8; place these fractions on the number line; compare and order them and relate the number line to a ruler (e.g., 1/2 = 2/4 = 4/8).	Fractions	3-NF.3. Understand that two fractions are equivalent (represent the same number) when both fractions correspond to the same point on a number line. Recognize and generate equivalent fractions with denominators 2, 3, 4, and 6 (e.g., 1/2 = 2/4, 4/6 = 2/3), and explain the reasoning.	
Number Sense and Operations	3.NSO-F.7. Know the meaning of 0.75, 0.50, and 0.25 as they relate to money; know that fractions and decimals are two different representations of the same concept (e.g., 50 cents is 1/2 of a dollar, 75 cents is 3/4 of a dollar).	Fractions	4-NF.7. Understand that a two-digit decimal is a sum of fractions with denominators 10 and 100. For example, 0.34 is 3/10 + 4/100. 4-NF.8. Use decimals to hundredths to describe parts of wholes; compare and order decimals to hundredths based on meanings of the digits; and write fractions of the form a/10 or a/100 in decimal notation. Use > and < symbols to record the results of comparisons.	
Number Sense and Operations	3.NSO-F.8. Know that any fraction can be written as a sum of unit fractions (e.g., 3/4 = ¼ + 1/4 + 1/4).	Fractions	3-NF.2. Understand that fractions are built from unit fractions. For example, 5/4 represents the point on a number line obtained by marking off five lengths of ¼ to the right of 0.	
Number Sense and Operations	3.NSO-F.9. Model and represent a mixed number (with denominator 2, 3, or 4) as a whole number and a fraction (e.g., 1 2/3, 3 1/2).	Fractions	5-NF.11. Understand that a mixed number such as 3 2/5 represents the sum of a whole number and a fraction less than one. Because a whole number can be represented as a fraction (3 = 3/1), and the sum of two fractions is also a fraction, a mixed number also represents a fraction (3 2/5 = 3 + 2/5 = 15/5 + 2/5 = 17/5). Write fractions as equivalent mixed numbers and vice versa.	
Computation				
Number Sense and Operations	3.NSO-C.10. Demonstrate an understanding of and the ability to use	Numbers - Operations	3-NOP.8. Solve one- or two-step word problems involving the four operations.	

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	conventional algorithms for the addition and subtraction of up to five-digit whole numbers.		This standard is limited to problems with whole-number quantities and whole-number quotients.	
Number Sense and Operations	3.NSO-C.11. Add and subtract up to four-digit whole numbers accurately and efficiently.	Numbers – Base Ten	3-NBT.4. Understand that when comparing four-digit numbers, if one number has more thousands, it is greater; if the amount of thousands is the same in each number, then the number with more hundreds is greater; and so on. Compare and order four-digit numbers based on meanings of the digits.	
Number Sense and Operations	3.NSO-C.12. Use concrete objects and visual models to add and subtract common fractions (halves, thirds, fourths, sixths, and eighths) with like denominators.	Geometry	2-G.6. Decompose circular and rectangular objects into two, three, or four equal parts. Describe the parts using the words halves, thirds, half of, a third of, etc.; describe the wholes as two halves, three thirds, four fourths. Recognize that a half, a third, or a fourth of a circular or rectangular object—a graham cracker, for example—is the same size regardless of its shape.	
Number Sense and Operations	3.NSO-C.13. Solve problems involving addition and subtraction of money amounts in decimal notation.	Numbers - Operations	3-NOP.8. Solve one- or two-step word problems involving the four operations. This standard is limited to problems with whole-number quantities and whole-number quotients.	
Number Sense and Operations	3.NSO-C.14. Know multiplication is the result of counting the total number of objects in a set of equal groups (e.g., 3 x 5 gives the number of objects in 3 groups of 5 objects).	Numbers - Operations	3-NOP.1. Understand that multiplication of whole numbers is repeated addition. For example, 5 x 7 means 7 added to itself 5 times. Products can be represented by rectangular arrays, with one factor the number of rows and the other the number of columns. 3-NOP.6. Understand that multiplication and division apply to situations with equal groups, arrays or area, and comparing. See Glossary, Table 2. 3-NOP.9. Understand that multiplication and division can be used to compare	

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			quantities (see Glossary, Table 2); solve multiplicative comparison problems with whole numbers (problems involving the notion of "times as much").	
Number Sense and Operations	3.NSO-C.15. Know division (÷) as another way of expressing multiplication, i.e., that division is the inverse of multiplication (e.g., 2 x 3 = 6 can be rewritten as 6 ÷ 2 = 3 or 6 ÷ 3 = 2).	Numbers - Operations	3-NOP.4. Understand that multiplication and division have an inverse relationship. For example, if 5 x 7 = 35 is known, then 35 x 5 = 7 and 35 x 7 = 5 are also known. The division 35 x 5 means the number which yields 35 when multiplied by 5; because 5 x 7 = 35, then 35 x 5 = 7.	
Number Sense and Operations	3.NSO-C.16. Know multiplication facts through 10 x 10 and related division facts (e.g., 9 x 8 = 72 and 72 ÷ 9 = 8). Use these facts to solve related problems (e.g., 3 x 5 is related to 3 x 50).	Numbers - Operations	3-NOP.9. Use a variety of strategies for multiplication and division within 100. By end of Grade 3, know from memory products of one-digit numbers where one of the factors is 2, 3, 4, or 5.	
Number Sense and Operations	3.NSO-C.17. Solve simple problems involving multiplication of multidigit whole numbers by one-digit numbers (2,431 x 2).	Numbers - Operations	3-NOP.8. Solve one- or two-step word problems involving the four operations. This standard is limited to problems with whole-number quantities and whole-number quotients.	
Number Sense and Operations	3.NSO-C.18. Solve division problems in which a multidigit whole number is evenly divided by a one-digit number (e.g., 125 ÷ 5).	Numbers - Operations	3-NOP.8. Solve one- or two-step word problems involving the four operations. This standard is limited to problems with whole-number quantities and whole-number quotients.	
Number Sense and Operations	3.NSO-C.19. Multiply up to two-digit whole numbers by a one-digit whole number accurately and efficiently.	Numbers - Operations	3-NOP.8. Fluently multiply one-digit numbers by 10.	
Number Sense and Operations	3.NSO-C.20. Use the commutative (order) and identity properties of addition and multiplication on whole numbers in computations and problem situations (e.g., 3 + 4 + 7 = 3 + 7 + 4 = 10 + 4).	Numbers - Operations	3-NOP.2. Understand the properties of multiplication. a. Multiplication is commutative. For example, the total number in 3 groups with 6 things each is the same as the total number in 6 groups with 3 things each, that is, 3 x 6 = 6 x 3.	

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			b. Multiplication is associative. For example, 4 x 3 x 2 can be calculated by first calculating 4 X 3 = 12 then calculating 12 x 2 = 24, or by first calculating 3 x 2 = 6 then calculating 4 x 6 = 24. 3-NOP.3. Explain and justify properties of multiplication and division, e.g., by using representations such as objects, drawings, and story contexts. Include properties such as: a. Changing the order of two factors does not change their product. f. Products where one factor is a one-digit number can be computed by decomposing one factor as the sum of two numbers, multiplying each number by the other factor, and adding the two products.	
Number Sense and Operations	3.NSO-C.21. Know and apply the special properties of 0 and 1 in multiplication.	Numbers - Operations	3-NOP.2. Understand the properties of multiplication. c. 1 is the multiplicative identity. 3-NOP.3. Explain and justify properties of multiplication and division, e.g., by using representations such as objects, drawings, and story contexts. Include properties such as: b. The product of a number and 1 is the number.	
Number Sense and Operations	3.NSO-C.22. Use multiplication and division fact families to understand the inverse relationship of these two operations and to compare and check results (e.g., because 3 x 8 = 24, we know that 24 ÷ 8 = 3 or 24 ÷ 3 = 8).	Numbers - Operations	3-NOP.3. Explain and justify properties of multiplication and division, e.g., by using representations such as objects, drawings, and story contexts. Include properties such as: d. Multiplying a quantity by a nonzero number, then dividing by the same number, yields the	

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			original quantity.	
Estimation				
Number Sense and Operations	3.NSO-E.23. Estimate the sum and difference of two numbers with three digits (sums up to 1,000) and judge reasonableness of estimates.	Numbers – Base Ten	3-NBT.5. Mentally calculate sums and differences of multiples of 10, 100, and 1000. For example, mentally calculate 1300 – 800 3-NBT.6. Given a number from 1000 to 9000, mentally find 100 more or 100 less than the number, and mentally find 1000 more or 1000 less than the number, without counting.	
Number Sense and Operations	3.NSO-E.24. Understand and use the strategies of rounding and regrouping to estimate quantities, measures, and the results of whole-number computations (addition, subtraction, and multiplication) up to two-digit whole numbers and amounts of money to $100 and to judge the reasonableness of answers.			
Patterns Relations and Algebra				
Patterns, Relations, and Algebra	3.PRA.1. Create, describe, and extend symbolic (geometric) patterns and addition and subtraction patterns.			
Patterns, Relations, and Algebra	3.PRA.2. Select appropriate operational and relational symbols to make an expression true (e.g., if 4 _ 3 = 12, what operational symbol goes in the blank?).	Numbers - Operations	3-NOP.5. Understand that when all but one of three numbers in a multiplication or division equation are known, the unknown number can be found. Limit to cases where the unknown number is a whole number.	
Patterns, Relations, and Algebra	3.PRA.3. Determine values of variables in simple equations involving addition, subtraction, or multiplication (e.g., 4106 – x = 37, 5 = x + 3, and x – x = 3).	Numbers - Operations	3-NOP.7. Solve word problems involving multiplication and division within 100, using an equation with a symbol for the unknown to represent the problem. This standard is limited to problems with whole-number quantities and whole-number quotients. Focus on situations described in the Glossary, Table 2.	
Patterns, Relations, and	3.PRA.4. Know and express the relationships among linear units of	Measurement and Data	3-MD.2. Understand that a unit of measure can be decomposed into equal-	

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Algebra	measure, i.e., unit conversions (e.g., 3 feet = 1 yard; 12 inches = 1 foot).		sized parts, whose sizes can be represented as fractions of the unit. Convert measurements in one unit to measurements in a smaller or a larger unit, and solve problems involving such mixed units (e.g., feet and inches, weeks and days).	
Patterns, Relations, and Algebra	3.PRA.5. Extend and recognize a linear pattern by its rules (e.g., the number of legs on a given number of horses may be calculated by counting by fours or by multiplying the number of horses by 4).	Numbers - Operations	3-NOP.6. Understand that multiplication and division apply to situations with equal groups, arrays or area, and comparing.	
Geometry				
Geometry	3.G.1. Compare and analyze attributes and other features (e.g., number and shape of sides, faces, corners, right angles) of two-dimensional geometric shapes, especially the attributes of triangles (isosceles, equilateral, right) and quadrilaterals (rectangle, square).	Geometry	3-G.1. Understand that a given category of plane figures (e.g., triangles) has subcategories (e.g., isosceles triangles) defined by special properties.	
Geometry	3.G.2. Describe, model, draw, compare, and classify three-dimensional and two-dimensional shapes, especially circles and polygons (e.g., triangles and quadrilaterals).	Geometry	3-G.2. Describe, analyze, compare and classify two-dimensional shapes by their properties and connect these properties to the classification of shapes into categories and subcategories (e.g., squares are “special rectangles” as well as “special rhombuses”). Focus on triangles and quadrilaterals.	
Geometry	3.G.3. Identify angles as right, acute (less than a right angle), or obtuse (greater than a right angle).	Geometry	3-G.1. Understand that a given category of plane figures (e.g., triangles) has subcategories (e.g., isosceles triangles) defined by special properties.	
Geometry	3.G.4. Identify and draw lines that are parallel, perpendicular, and intersecting.	Geometry	4-G.1. Draw points, lines, line segments, rays, angles, and perpendicular and parallel lines; identify these in plane figures.	
Geometry	3.G.5. Identify and draw lines of symmetry in two-dimensional shapes.	Geometry	3-G.5. Understand that shapes can be decomposed into parts with equal areas; the area of each part is a unit fraction of	

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			the whole. For example, when a shape is partitioned into 4 parts with equal area, the area of each part is ¼ of the area of the shape.	
Geometry	3.G.6. Apply techniques such as reflections (flips), rotations (turns), and translations (slides) for determining if two shapes are congruent.			
Geometry	3.G.7. Using ordered pairs of whole numbers and/or letters, locate and identify points on a grid.	Geometry	5-G.1. Understand that a pair of perpendicular number lines, called axes, defines a coordinate system. a. Their intersection is called the origin, usually arranged to coincide with the 0 on each line. b. A given point in the plane can be located by using an ordered pair of numbers, called its coordinates. The first number indicates how far to travel from the origin in the direction of one axis, the second number indicates how far to travel in the direction of the second axis. c. To avoid ambiguity, conventions dictate that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). 5-G.2. Graph points in the first quadrant of the coordinate plane, and identify the coordinates of graphed points. Where ordered pairs arise in a problem situation, interpret the coordinate values in the context of the situation.	
Measurement				
Measurement	3.M.1. Demonstrate an understanding of such attributes as length, area, and weight; select the appropriate type of	Measurement and Data	2-MD.6. Understand that a sum of two whole numbers can represent a combination of two lengths; a difference	

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	unit for measuring each attribute using both the U.S. customary and metric systems.		of two whole numbers can represent a difference in length; find total lengths and differences in lengths using addition and subtraction. 3-MD.4. Understand that multiplication of whole numbers can be represented by area models; a rectangular region that is a length units by b length units (where a and b are whole numbers) and tiled with unit squares illustrates why the rectangle encloses an area of a x b square units.	
Measurement	3.M.2. Carry out simple unit conversions within a system of measurement such as hours to minutes and cents to dollars (e.g., 1 hour = 60 minutes).	Measurement and Data	3-MD.2. Understand that a unit of measure can be decomposed into equal-sized parts, whose sizes can be represented as fractions of the unit. Convert measurements in one unit to measurements in a smaller or a larger unit, and solve problems involving such mixed units (e.g., feet and inches, weeks and days).	
Measurement	3.M.3. Identify time to the nearest 5 minutes on analog and digital clocks using a.m. and p.m. Compute elapsed time using a clock (e.g., hours and minutes since …) and using a calendar (e.g., days since …).			
Measurement	3.M.4. Estimate and find area and perimeter of a rectangle and triangle using diagrams, models, and grids or by measuring.	Measurement and Data	3-MD.3. Understand and use concepts of area measurement. a. A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area. b. A plane figure which can be covered without gaps or overlaps by n unit squares has an area of n square units. Areas of some other figures can be measured by using fractions of unit squares or using figures whose areas have been	

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		Geometry	found by decomposing other figures. c. When measuring an area, if a smaller unit of measurement is used, more units must be iterated to measure the area in those units. d. Determine and compare areas by counting square units. Use cm^2, m^2, in^2, ft^2, and improvised units. 3-MD.4. Understand that multiplication of whole numbers can be represented by area models; a rectangular region that is a length units by b length units (where a and b are whole numbers) and tiled with unit squares illustrates why the rectangle encloses an area of a x b square units. 3-G.3. Understand that rectangular regions can be tiled with squares in rows and columns, or decomposed into such arrays.	
Data Analysis Statistics and Probability				
Data Analysis, Statistics, and Probability	3.DASP.1. Collect and organize data using observations, measurements, surveys, or experiments.	Measurement and Data	3-MD.7. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a dot plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	
Data Analysis, Statistics, and Probability	3.DASP.2. Construct, identify the main idea, and make predictions from various representations of data sets in the forms of tables, bar graphs (horizontal and vertical forms), pictographs, and tallies.	Measurement and Data	3-MD.6. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. Include single-unit scales and multiple-unit scales; for example, each square in the bar graph might represent 1 pet, 5 pets, or 10 pets.	

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Data Analysis, Statistics, and Probability	3.DASP.3. Record all possible outcomes for a simple event using concrete objects (e.g., tossing a coin).	Measurement and Data	2-MD.9. Generate measurement data by measuring whole-unit lengths of several objects, or by making repeated measurements of the same object. Show the measurements by making a dot plot, where the horizontal scale is marked off in whole-number units. 2-MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with several categories. Connect representations on bar graph scales, rulers, and number lines that begin with zero. Solve simple Put Together/Take Apart and Compare problems using information presented in a bar graph.	
Data Analysis, Statistics, and Probability	3.DASP.4. Classify outcomes as certain, likely, unlikely, or impossible.			
Data Analysis, Statistics, and Probability	3.DASP.5. List and count the number of possible combinations of objects from 2 sets (e.g., How many different outfits can one make from a set of 2 sweaters and a set of 3 skirts?).			
		Numbers - Operations	3-NOP.3. Explain and justify properties of multiplication and division, e.g., by using representations such as c. Dividing a nonzero number by itself yields 1. f. Products where one factor is a one-digit number can be computed by decomposing one factor as the sum of two numbers, multiplying each number by the other factor, and adding the two products.	
		Measurement and Data	3-MD.1. Understand that a number line has an origin (0) and a unit (1), with whole numbers one unit distance apart. Use number lines to represent problems	

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			involving distances, elapsed time, amounts of money and other quantities. In such problems, the interval from 0 to 1 may represent a unit of distance, time, money, etc.	
		Measurement and Data	3-MD.5. Solve problems involving perimeters of polygons. a. Add given side lengths, and multiply for the case of equal side lengths. b. Find an unknown length of a side in a polygon given the perimeter and all other side lengths; represent these problems with equations involving a letter for the unknown quantity. c. Exhibit rectangles with the same perimeter and different area, and with the same area and different perimeter.	
		Geometry	3-G.4. Structure a rectangular region spatially by decomposing it into rows and columns of squares. Determine the number of squares in the region using that spatial structure (e.g., by multiplication or skip counting).	

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Number Sense				
Number Sense and Operations	4.NSO-N.1. Exhibit an understanding of the base 10 number system by reading, modeling, and writing whole numbers to at least 100,000; demonstrating an understanding of the values of the digits; and comparing and ordering the numbers.	Numbers – Base Ten	4-NBT.1. Understand that a digit in one place represents ten times what it represents in the place to its right. For example, 7 in the thousands place represents 10 times as many as than 7 in the hundreds place. 4-NBT.2. Read, write and compare numbers to 100,000 using base-ten notation, number names, and expanded form.	
Number Sense and Operations	4.NSO-N.2. Represent, compare, and order numbers to 100,000 using various forms, including expanded notation.	Numbers – Base Ten	4-NBT.2. Read, write and compare numbers to 100,000 using base-ten notation, number names, and expanded form.	
Number Sense and Operations	4.NSO-N.3. Round whole numbers to 100,000 to the nearest 10, 100, 1,000, 10,000, and 100,000.	Numbers - Operations	4-NOP.4. Assess the reasonableness of answers using mental computation and estimation strategies including rounding to the nearest 10 or 100.	
Number Sense and Operations	4.NSO-N.4. Recognize sets to which a number may belong (odds, evens, multiples and factors of given numbers, and squares), and use these in the solution of problems.	Numbers – Base Ten	3-NBT.9. Use a variety of strategies for multiplication and division within 100. By end of Grade 3, know from memory products of one-digit numbers where one of the factors is 2, 3, 4, or 5. 4-NBT.4. Fluently multiply and divide within 100. By end of Grade 4, know from memory products of one-digit numbers where one of the factors is 6, 7, 8, or 9.	
Number Sense and Operations	4.NSO-N.5. Read and interpret whole numbers and decimals up to two decimal places; relate to money and place-value decomposition.	Fractions	4-NF.8. Use decimals to hundredths to describe parts of wholes; compare and order decimals to hundredths based on meanings of the digits; and write fractions of the form a/10 or a/100 in decimal notation. Use > and < symbols to record the results of comparisons.	
Number Sense and Operations	4.NSO-N.6. Determine if a whole number is a multiple of a given one-digit whole number and if a one-digit number is a	Numbers – Base Ten	3-NBT.9. Use a variety of strategies for multiplication and division within 100. By end of Grade 3, know from memory	

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	DC Math Standards		Common Core Standards	Comments
	factor of a given whole number.		products of one-digit numbers where one of the factors is 2, 3, 4, or 5. 4-NBT.4. Fluently multiply and divide within 100. By end of Grade 4, know from memory products of one-digit numbers where one of the factors is 6, 7, 8, or 9.	
Number Sense and Operations	4.NSO-N.7. Find all factors of a whole number up to 50; know that numbers such as 2, 3, 5, 7, and 11 do not have any factors except one and itself and that such numbers are called prime numbers.	Numbers - Operations	4-NOP.1. Find the factor pairs for a given whole number less than or equal to 100; recognize prime numbers as numbers greater than 1 with exactly one factor pair. Example: The factor pairs of 42 are {42, 1}, {21, 2}, {14, 3}, {7, 6}.	
Number Sense and Operations	4.NSO-N.8. Use concepts of negative numbers (e.g., on a number line, in counting, in temperature, in owing money).	Number Sense	6-NS.6. Understand that some quantities have opposite directions, such as elevation above and below sea level or money received and spent. These quantities can be described using positive and negative numbers.	
Fractions				
Number Sense and Operations	4.NSO-F.9. Demonstrate an understanding of fractions as parts of unit wholes, as parts of a collection, and as locations on a number line.	Fractions	3-NF.1. Understand that a unit fraction corresponds to a point on a number line. For example, 1/3 represents the point obtained by decomposing the interval from 0 to 1 into three equal parts and taking the right-hand endpoint of the first part. In Grade 3, all number lines begin with zero. 3-NF.2. Understand that fractions are built from unit fractions. For example, 5/4 represents the point on a number line obtained by marking off five lengths of ¼ to the right of 0. 3-NF.4. Understand that whole numbers can be expressed as fractions. Three important cases are illustrated by the examples 1 = 4/4, 6 = 6/1, and 7 = (4 x 7)/4. Expressing whole numbers as fractions can be useful for solving problems or making calculations.	

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			3-NF.5. Understand that fractions apply to situations where a whole is decomposed into equal parts; use fractions to describe parts of wholes. For example, to show 1/3 of a length, decompose the length into 3 equal parts and show one of the parts.	
Number Sense and Operations	4.NSO-F.10. Know the relationships among halves, fourths, and eighths and among thirds, sixths, and twelfths; compare and order such fractions.	Fractions	3-NF.3. Understand that two fractions are equivalent (represent the same number) when both fractions correspond to the same point on a number line. Recognize and generate equivalent fractions with denominators 2, 3, 4, and 6 (e.g., 1/2 = 2/4, 4/6 = 2/3), and explain the reasoning.	
Number Sense and Operations	4.NSO-F.11. Recognize, name, and generate equivalent forms of common decimals (0.5, 0.25, 0.2, 0.1) and fractions (halves, quarters, fifths, and tenths) and explain why they are equivalent.	Fractions	4-NF.7. Understand that a two-digit decimal is a sum of fractions with denominators 10 and 100. For example, 0.34 is 3/10 + 4/100.	
Number Sense and Operations	4.NSO-F.12. Select, use, and explain models to relate common fractions and mixed numbers (e.g., 1/2, 1/3, 1/4, 1/5, 1/8, 1/10, 1/12, and 1 1/2); find equivalent fractions, mixed numbers, and decimals.	Fractions	4-NF.8. Use decimals to hundredths to describe parts of wholes; compare and order decimals to hundredths based on meanings of the digits; and write fractions of the form a/10 or a/100 in decimal notation. Use > and < symbols to record the results of comparisons.	
Number Sense and Operations	4.NSO-F.13. Represent positive decimals to the hundredths.	Fractions	4-NF.8. Use decimals to hundredths to describe parts of wholes; compare and order decimals to hundredths based on meanings of the digits; and write fractions of the form a/10 or a/100 in decimal notation. Use > and < symbols to record the results of comparisons.	
Computation				
Number Sense and Operations	4.NSO-C.14. Demonstrate an understanding of and the ability to use conventional algorithms for the addition and subtraction of multidigit whole numbers.	Numbers – Base Ten	2-NBT.13. Compute sums of two three-digit numbers, and compute sums of three or four two-digit numbers, using the standard algorithm; compute differences of two three-digit numbers using the standard algorithm.	

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	DC Math Standards		Common Core Standards	Comments
Number Sense and Operations	4.NSO-C.15. Add and subtract up to five-digit numbers accurately and efficiently.	Numbers – Base Ten	2-NBT.13. Compute sums of two three-digit numbers, and compute sums of three or four two-digit numbers, using the standard algorithm; compute differences of two three-digit numbers using the standard algorithm.	
Number Sense and Operations	4.NSO-C.16. Use concrete objects and visual models to add and subtract fractions where the denominators are equal or when one denominator is a multiple of the other (denominators 2 through 12, and 100).	Fractions	3-NF.6. Compare and order fractional quantities with equal numerators or equal denominators, using the fractions themselves, tape diagrams, number line representations, and area models. Use > and < symbols to record the results of comparisons.	
Number Sense and Operations	4.NSO-C.17. Select, use, and explain various meanings and models of multiplication and division of whole numbers. Understand and use the inverse relationship between the two operations.	Numbers – Base Ten	4-NBT.7. Explain why multiplication and division strategies and algorithms work, using place value and the properties of operations. Include explanations supported by drawings, equations, or both. A range of reasonably efficient algorithms may be covered, not only the standard algorithms.	
Number Sense and Operations	4.NSO-C.18. Know multiplication facts through 12 x 12 and the inverse division facts. Use these facts to solve related multiplication problems and compute related problems.	Numbers – Base Ten	4-NBT.4. Fluently multiply and divide within 100. By end of Grade 4, know from memory products of one-digit numbers where one of the factors is 6, 7, 8, or 9.	
Number Sense and Operations	4.NSO-C.19. Demonstrate understanding of and ability to use the conventional algorithms for multiplication of up to a three-digit whole number by a two-digit whole number. Multiply three-digit whole numbers by two-digit whole numbers accurately and efficiently.	Numbers – Base Ten	3-NBT.7. Understand that the distributive property is at the heart of strategies and algorithms for multiplication and division computations with numbers in base-ten notation; use the distributive property and other properties of operations to explain patterns in the multiplication table and to derive new multiplication and division equations from known ones. For example, the distributive property makes it possible to multiply 4 x 7 by decomposing 7 as 5 + 2 and using 4 x 7 = 4 x (5 + 2) = (4 x 5) + (4 x 2) = 20 + 8 = 28.	

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			4-NBT.6. Compute products and whole number quotients of two-, three- or four-digit numbers and one-digit numbers, and compute products of two two-digit numbers, using strategies based on place value, the properties of operations, and/or the inverse relationship between multiplication and division; explain the reasoning used. 4-NBT.8. Compute products of two-digit numbers using the standard algorithm, and check the result using estimation.	
Number Sense and Operations	4.NSO-C.20. Demonstrate understanding of and the ability to use the conventional algorithm for division of up to a three-digit whole number with a single-digit divisor (with or without remainders). Divide up to a three-digit whole number with a single-digit divisor accurately and efficiently. Interpret any remainders.	Numbers – Base Ten	4-NBT.6. Compute products and whole number quotients of two-, three- or four-digit numbers and one-digit numbers, and compute products of two two-digit numbers, using strategies based on place value, the properties of operations, and/or the inverse relationship between multiplication and division; explain the reasoning used.	
Number Sense and Operations	4.NSO-C.21. Multiply fractions by whole numbers, using repeated addition and area rectangular models.	Fractions	4-NF.3. Understand that the meaning of multiplying a fraction by a whole number comes from interpreting multiplication by a whole number as repeated addition. For example, 3 x 2/5 = 6/5 because 3 x 2/5 = 2/5 + 2/5 + 2/5 = 6/5. 4-NF.4. Solve word problems that involve multiplication of fractions by whole numbers; represent multiplication of fractions by whole numbers using tape diagrams and area models that explain numerical results.	
Number Sense and Operations	4.NSO-C.22. Mentally calculate simple products and quotients up to a three-digit number by a one-digit number (e.g., 400 x 7, or 320 ÷ 8).	Numbers – Base Ten	4-NBT.5. Mentally calculate products of one-digit numbers and one-digit multiples of 10, 100, and 1000 (e.g., 7 x 6000). Mentally calculate whole number quotients with divisors of 10 and 100.	
Number Sense	4.NSO-C.23. Multiply and divide money	Numbers –	5-NBT.13. Use the standard algorithm for	

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and Operations	amounts in decimal notation by using whole-number multipliers and divisors.	Base Ten	each of the four operations on decimals (to hundredths). 5-NBT.14. Solve word problems involving operations on decimals.	
Number Sense and Operations	4.NSO-C.24. Determine the unit cost when given the total cost and number of units.	Numbers – Base Ten	5-NBT.13. Use the standard algorithm for each of the four operations on decimals (to hundredths). 5-NBT.14. Solve word problems involving operations on decimals.	
Number Sense and Operations	4.NSO-C.25. Select and use appropriate operations (addition, subtraction, multiplication, and division) to solve problems, including those involving money.	Numbers - Operations	4-NOP.2. Solve multi-step word problems involving the four operations with whole numbers.	
Number Sense and Operations	4.NSO-C.26. Select, use, and explain the commutative, associative, and identity properties of operations on whole numbers in problem situations, e.g., 37 x 46 = 46 x 37, (5 x 7) x 2 = 5 x (7 x 2).	Numbers - Operations	3-NOP.2. Understand the properties of multiplication. a. Multiplication is commutative. For example, the total number in 3 groups with 6 things each is the same as the total number in 6 groups with 3 things each, that is, 3 x 6 = 6 x 3. b. Multiplication is associative. For example, 4 x 3 x 2 can be calculated by first calculating 4 ? 3 = 12 then calculating 12 x 2 = 24, or by first calculating 3 x 2 = 6 then calculating 4 x 6 = 24. c. 1 is the multiplicative identity. d. Multiplication distributes over addition (the distributive property). For example, 5 x (3 + 4) = (5 x 3) + (5 x 4).	
Number Sense and Operations	4.NSO-C.27. Use the relationship between multiplication and division to simplify computations and check results.	Numbers - Operations	3-NOP.4. Understand that multiplication and division have an inverse relationship. For example, if 5 x 7 = 35 is known, then 35 x 5 = 7 and 35 x 7 = 5 are also known. The division 35 x 5 means the number which	

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			yields 35 when multiplied by 5; because 5 x 7 = 35, then 35 x 5 = 7. 3-NOP.5. Understand that when all but one of three numbers in a multiplication or division equation are known, the unknown number can be found. Limit to cases where the unknown number is a whole number.	
Estimation				
Number Sense and Operations	4.NSO-E.28. Estimate and compute the sum or difference of whole numbers and positive decimals to two places.		5-NBT.9. Fluently find 0.1 more than a number and less than a number; 0.01 more than a number and less than a number; and 0.001 more than a number and less than a number, for numbers expressed as finite decimals. 5-NBT.14. Solve word problems involving operations on decimals.	
Number Sense and Operations	4.NSO-E.29. Estimate the answers to calculations involving addition, subtraction, or multiplication; know when approximation or a rounded solution is appropriate and use it to check the reasonableness of answers.	Numbers - Operations Numbers – Base Ten	4-NOP.4. Assess the reasonableness of answers using mental computation and estimation strategies including rounding to the nearest 10 or 100. 4-NBT.8. Compute products of two-digit numbers using the standard algorithm, and check the result using estimation.	
Number Sense and Operations	4.NSO-E.30. Select and use a variety of strategies (e.g., front-end, rounding, and regrouping) to estimate quantities, measures, and the results of whole-number computations up to three-digit whole numbers and amounts of money to $1,000 and to judge the reasonableness of answers.			
Patterns Relations and Algebra				
Patterns, Relations, and Algebra	4.PRA.1. Create, describe, extend, and explain geometric and numeric patterns, including multiplication patterns such as 3, 30, 300, and 3,000; generalize the rule for the pattern and make predictions when given a table of number pairs of a set of data.			

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Patterns, Relations, and Algebra	4.PRA.2. Use letters and other symbols (e.g., _, x) as variables in expressions and in equations or inequalities (mathematical sentences that use =, <, and >).			
Patterns, Relations, and Algebra	4.PRA.3. Use pictures, models, tables, charts, graphs, words, number sentences, and mathematical notations to interpret mathematical relationships.	Measurement and Data	4-MD.7. Make a dot plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in dot plots. For example, from a dot plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.	
Patterns, Relations, and Algebra	4.PRA.4. Solve problems involving proportional relationships, including unit pricing (e.g., 4 apples cost 80 cents, so 1 apple costs 20 cents) and map interpretation (e.g., 1 inch represents 5 miles, so 2 inches represent 10 miles).	Numbers - Operations	4-NOP.3. Solve problems posed with both whole numbers and fractions. Understand that while quantities in a problem might be described with whole numbers, fractions, or decimals, the operations used to solve the problem depend on the relationships between the quantities regardless of which number representations are involved.	
Patterns, Relations, and Algebra	4.PRA.5. Determine how change in one variable relates to a change in a second variable (e.g., input-output tables).			
Geometry				
Geometry	4.G.1. Compare and analyze attributes and other features (e.g., number of sides, faces, corners, right angles, diagonals, and symmetry) of two- and three-dimensional geometric shapes.	Geometry	4-G.1. Draw points, lines, line segments, rays, angles, and perpendicular and parallel lines; identify these in plane figures. 4-G.2. Identify right angles, and angles smaller than or greater than a right angle in geometric figures; recognize right triangles.	
Geometry	4.G.2. Describe, model, draw, compare, and classify two- and three-dimensional shapes (e.g., circles, polygons, parallelograms, trapezoids, cubes,	Geometry	3-G.2. Describe, analyze, compare and classify two-dimensional shapes by their properties and connect these properties to the classification of shapes into categories	

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	spheres, pyramids, cones, cylinders).		and subcategories (e.g., squares are "special rectangles" as well as "special rhombuses"). Focus on triangles and quadrilaterals.	
Geometry	4.G.3. Know the definitions of a right angle, an acute angle, and an obtuse angle. Understand that 90°, 180°, 270°, and 360° are associated, respectively, with 1/4, 1/2, 3/4, and full turns.	Measurement and Data Geometry	4-MD.5. Understand what an angle is and how it is measured: a. An angle is formed by two rays with a common endpoint. b. An angle is measured by reference to a circle with its center at the common endpoint of the rays. The measure of an angle is based on the fraction of the circle between the points where the two rays intersect the circle. c. A one-degree angle turns through 1/360 of a circle, where the circle is centered at the common endpoint of its rays; the measure of a given angle is the number of one-degree angles turned with no gaps or overlaps. 4-G.2. Identify right angles, and angles smaller than or greater than a right angle in geometric figures; recognize right triangles.	
Geometry	4.G.4. Describe and draw intersecting, parallel, and perpendicular lines.	Geometry	4-G.3. Classify shapes based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of specified size.	
Geometry	4.G.5. Recognize similar figures (two shapes, R and S, are similar if they are congruent after one of them is shrunk or expanded).	Geometry	3-G.5. Understand that shapes can be decomposed into parts with equal areas; the area of each part is a unit fraction of the whole. For example, when a shape is partitioned into 4 parts with equal area, the area of each part is ¼ of the area of the shape.	
Geometry	4.G.6. Describe and apply techniques such as reflections (flips), rotations			

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	(turns), and translations (slides) for determining if two shapes are congruent.			
Geometry	4.G.7. Predict and validate the results of partitioning, folding, and combining two- and three-dimensional shapes.	Geometry	4-G.4. Understand that a line of symmetry for a geometric figure is a line across the figure such that the figure can be folded along the line into matching parts	
Geometry	4.G.8. Using ordered pairs of numbers and/or letters, graph, locate, and identify points and describe paths (first quadrant).	Geometry	5-G.2. Graph points in the first quadrant of the coordinate plane, and identify the coordinates of graphed points. Where ordered pairs arise in a problem situation, interpret the coordinate values in the context of the situation.	
Measurement				
Measurement	4.M.1. Identify and use appropriate metric and U.S. customary units and tools (e.g., ruler, protractor, graduated cylinder, thermometer) to estimate, measure, and solve problems involving length, area, volume, weight, time, angle size, and temperature.			
Measurement	4.M.2. Carry out simple unit conversions within a system of measurement (e.g., yards to feet or inches; gallons to quarts and pints).	Measurement and Data	5-MD.3. Convert among different-sized standard measurement units within a given measurement system (e.g., feet to yards, centimeters to meters) and use conversion in solving multi-step word problems.	
Measurement	4.M.3. Identify time to the minute on analog and digital clocks using a.m. and p.m. Compute elapsed time using a clock (e.g., hours and minutes since…) and using a calendar (e.g., days since …).			
Measurement	4.M.4. Estimate and find area and perimeter of shapes, including irregular shapes, using diagrams, models, and grids or by measuring.	Measurement and Data	4-MD.2. Understand that if a region is decomposed into several disjoint pieces, then the area of the region can be found by adding the areas of the pieces (when these areas are expressed in the same units). 4-MD.3. Apply the formulas for area of	

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			squares and rectangles. Measure and compute whole-square-unit areas of objects and regions enclosed by geometric figures which can be decomposed into rectangles. Limit to situations requiring products of one-or two-digit numbers. 4-MD.4. Find one dimension of a rectangle, given the other dimension and the area or perimeter; find the length of one side of a square, given the area or perimeter. Represent these problems using equations involving a letter for the unknown quantity.	
Measurement	4.M.5. Recognize that rectangles that have the same area can have different perimeters; understand that rectangles that have the same perimeter can have different areas.	Measurement and Data	3-MD.5. Solve problems involving perimeters of polygons. c. Exhibit rectangles with the same perimeter and different area, and with the same area and different perimeter.	
Data Analysis Statistics and Probability				
Data Analysis, Statistics, and Probability	4.DASP.1. Collect and organize data using observations, measurements, surveys, or experiments, and identify appropriate ways to display the data.			
Data Analysis, Statistics, and Probability	4.DASP.2. Match a representation of a data set, such as lists, tables, or graphs (including circle graphs), with the actual set of data.	Measurement and Data	4-MD.7. Make a dot plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in dot plots. For example, from a dot plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.	
Data Analysis, Statistics, and Probability	4.DASP.3. Compare two data sets represented in two bar graphs, pie graphs, and histograms.			
Data Analysis, Statistics, and Probability	4.DASP.4. Represent the possible outcomes for a simple probability situation (e.g., the probability of drawing			

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	a red marble from a bag containing 2 red marbles and 4 green marbles).			
Data Analysis, Statistics, and Probability	4.DASP.5. List and count the number of possible combinations of objects from 3 sets (e.g., How many different outfits can one make from a set of 3 shirts, a set of 2 skirts, and a set of 2 hats?).			
		Numbers – Base Ten	4-NBT.9. Given two whole numbers, find an equation displaying the largest multiple of one which is less than or equal to the other. For example, given 325 and 7, the equation 325 = 46 x 7 + 3 shows the largest multiple of 7 less than or equal to 325.	
		Fractions	4-NF.1. Understand addition of fractions: a. Adding or subtracting fractions with the same denominator means adding or subtracting copies of unit fractions. For example, 2/3 + 4/3 is 2 copies of 1/3 plus 4 copies of 1/3, or 6 copies of 1/3 in all, that is 6/3. b. Sums of related fractions can be computed by replacing one with an equivalent fraction that has the same denominator as the other. For example, the sum of the related fractions 2/3 and 1/6 can be computed by rewriting 2/3 as 4/6 and computing 4/6 + 1/6 = 5/6.	
		Fractions	4-NF.2. Compute sums and differences of fractions with like denominators, add and subtract related fractions within 1 (e.g., 1/2 + 1/4, 3/10 + 4/100, 7/8 – 1/4), and solve word problems involving these operations.	
		Fractions	4-NF.5. Understand that fractions give meaning to the quotient of any whole	

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			number by any non-zero whole number. For example, 3 ÷ 4 = 3/4, because 3/4 multiplied by 4 equals 3. (The division 3 ÷ 4 means the number which yields 3 when multiplied by 4.)	
		Fractions	4-NF.6. Solve word problems that involve non-whole number quotients of whole numbers; represent quotients of whole numbers using tape diagrams and area models that explain numerical results.	
		Measurement and Data	4-MD.1. Understand that the unit length on a number line (interval from 0 to 1) can be divided into parts of equal fractional length. Draw number line representations of problem situations involving length, height, and distance including fractional or decimal units. For example, show distances along a race course to tenths of a mile on a number line, by dividing the unit length into 10 equal parts to get parts of length 1/10; the endpoint of the segment of 1/10 length from 0 represents 1/10 of a mile from the starting point of the race. In Grade 4, all numbers lines begin with zero.	
		Geometry	4-G.5. Identify line-symmetric figures; given a horizontal or vertical line and a drawing that is not a closed figure, complete the drawing to create a figure that is symmetric with respect to the given line.	

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Number Sense				
Number Sense and Operations	5.NSO-N.1. Estimate, round, and manipulate very large (e.g., billions) and very small (e.g., thousandths) numbers; demonstrate an understanding of place value to billions and thousandths.	Numbers – Base Ten	5-NBT.6. Round decimals (to hundredths) to the nearest whole number. 5-NBT.5. Read, write, and compare numbers expressed as decimals. Understand that a digit in one place represents ten times what it represents in the place to its right. For example, 7 in the hundredths place represents 10 times as many as 7 in the thousandths place.	
Number Sense and Operations	5.NSO-N.2. Represent and compare very large (billions) and very small (thousandths) positive numbers in various forms, such as expanded notation without exponents, e.g., 9,724 = (9 x 1,000) + (7 x 100) + (2 x 10) + 4.	Numbers – Base Ten	5-NBT.8. Understand that in adding or subtracting finite decimals, one adds or subtracts like units (tenths and tenths, hundredths and hundredths, etc.) and sometimes it is necessary to compose or decompose a higher value unit.	
Number Sense and Operations	5.NSO-N.3. Find and position integers, fractions, mixed numbers, and decimals (both positive and negative) on the number line.	Fractions	5-NF.3. Compare and order fractions with like or unlike denominators, e.g., by finding equivalent fractions with the same denominator, and describe the sizes of fractional quantities from a context with reference to the context. Compare using the fractions themselves, tape diagrams or number line representations, and area models. 5-NF.8. Explain and justify the properties of operations with fractions, e.g., by using equations, number line representations, area models, and story contexts.	
Number Sense and Operations	5.NSO-N.4. Compare and order integers (including negative integers) and positive fractions, mixed numbers, decimals, and percents.	Numbers – Base Ten	5-NBT.7. Write fractions in decimal notation for fractions with denominators 2, 4, 5, 8, 10, and 100.	
Number Sense and Operations	5.NSO-N.5. Apply the number theory concepts of common factor, common			

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	multiple, and divisibility rules for 2, 3, 5, and 10 to the solution of problems. Demonstrate an understanding of the concepts of prime and composite numbers.			
Number Sense and Operations	5.NSO-N.6. Know the set of prime numbers to 100.			
Number Sense and Operations	5.NSO-N.7. Determine the prime factors of all numbers through 100, and write the numbers as the product of their prime factors by using exponents to show multiples of a factor (e.g., 24 = 2 x 2 x 2 x 3 = 23 x 3).			
Fractions				
Number Sense and Operations	5.NSO-F.8. Explain different interpretations of fractions as a ratio of whole numbers, as parts of unit wholes, as parts of a collection, as division of whole numbers by whole numbers, and as locations on the number line.	Fractions	3-NF.5. Understand that fractions apply to situations where a whole is decomposed into equal parts; use fractions to describe parts of wholes. For example, to show 1/3 of a length, decompose the length into 3 equal parts and show one of the parts.	
Number Sense and Operations	5.NSO-F.9. Interpret percents as parts out of 100, use % notation, and express a part of a whole as a percentage.		7-RP.6. Understand that percentages are rates per 100. For example, 30% of a quantity means 30/100 times the quantity. A percentage can be a complex fraction, as in 3.75% = 3.75/100.	
Number Sense and Operations	5.NSO-F.10. Identify and determine common equivalent fractions, mixed numbers (with denominators 2, 4, 5, and 10), decimals, and percents, and explain why they represent the same value.	Fractions	5-NF.2. Identify pairs of equivalent fractions; given two fractions with unlike denominators, find two fractions with the same denominator and equivalent to each. 5-NF.1. Understand fraction equivalence: a. Multiplying the numerator and denominator of a fraction by the same nonzero whole number produces an equivalent fraction. For example, 2/3 = (2 x 4)/(3 x 4) = 8/12. (1/3 is 4 copies of 1/12, so 2/3 is 8 copies of 1/12.) b. Equivalent fractions correspond to the same point on a number line. In	

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			Grade 5, all numbers lines begin with zero. c. When the numerators of equivalent fractions are divided by their denominators, the resulting quotients are the same. 7-RP.6. Understand that percentages are rates per 100. For example, 30% of a quantity means 30/100 times the quantity. A percentage can be a complex fraction, as in 3.75% = 3.75/100.	
Number Sense and Operations	5.NSO-F.11. Write improper fractions as mixed numbers, and know that a mixed number represents the number of "wholes" and the part of a whole remaining (e.g., 5/4 = 1 + 1/4 = 1 1/4).		5-NF.11. Understand that a mixed number such as 3 2/5 represents the sum of a whole number and a fraction less than one. Because a whole number can be represented as a fraction (3 = 3/1), and the sum of two fractions is also a fraction, a mixed number also represents a fraction (3 2/5 = 3 + 2/5 = 15/5 + 2/5 = 17/5). Write fractions as equivalent mixed numbers and vice versa.	
Computation				
Number Sense and Operations	5.NSO-C.12. Add with negative integers, subtract positive integers from negative integers, and verify the reasonableness of the results.		6-NS.7. Understand that number lines familiar from previous grades can be extended to represent negative numbers to the left of zero. Number lines can also be vertically oriented, as when a coordinate system is formed. Then the conventional terms "to the right of 0" and "to the left of 0" conventionally become "above 0" and "below 0." 7-NS.2. Understand and perform addition and subtraction with rational numbers: a. Understand that on a number line, the sum p + q is the number located a distance |q| from p, to the right of p if q is positive and to the left of p if q is negative. A number and its opposite are	

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			additive inverses (i.e., their sum is zero). b. Compute sums of signed numbers using the laws of arithmetic. For example, 7 + (–3) = 4 because 7 + (–3) = (4 + 3) + (–3) = 4 + [3 + (–3)] = 4 + [0] = 4. c. Understand that subtraction of rational numbers is defined by viewing a difference as the solution of an unknown-addend addition problem. Subtraction of a rational number gives the same answer as adding its additive inverse. d. Explain and justify rules for adding and subtracting rational numbers, using a number line and practical contexts. For example, relate r + (–s) = r – s to a bank transaction; explain why p – (q + r) = p – q – r. e. Understand that the additive inverse of a sum is the sum of the additive inverses, that is –(p + q) = –p + –q. For example, –(6 + –2) = (–6) + 2 because [6 + (–2)] + [(–6) + 2] = [6 + (–6)] + [(–2) + 2] = [0] + [0] = 0.	
Number Sense and Operations	5.NSO-C.13. Add and subtract fractions (including mixed numbers) with like and unlike denominators (of 2, 3, 4, 5 and 10), and express answers in the simplest form.	Fractions	5-NF.4. Understand that sums and differences of fractions with unlike denominators can be computed by replacing each with an equivalent fraction so that the resulting fractions have the same denominator. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. 5-NF.5. Compute sums and differences of	

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			fractions with like or unlike denominators, and solve word problems involving addition and subtraction of fractions. Estimate fraction sums and differences to assess the reasonableness of results.	
Number Sense and Operations	5.NSO-C.14. Add and subtract positive decimals	Numbers – Base Ten	5-NBT.8. Understand that in adding or subtracting finite decimals, one adds or subtracts like units (tenths and tenths, hundredths and hundredths, etc.) and sometimes it is necessary to compose or decompose a higher value unit. 5-NBT.9. Fluently find 0.1 more than a number and less than a number; 0.01 more than a number and less than a number; and 0.001 more than a number and less than a number, for numbers expressed as finite decimals. 5-NBT.11. Compute sums, differences, products, and quotients of finite decimals using strategies based on place value, the properties of operations, and/or the inverse relationships between addition and subtraction and between multiplication and division; explain the reasoning used. For example, transform 1.5 x 0.3 into 15 ÷ 3 = 5. 5-NBT.12. Explain why strategies and algorithms for computations with finite decimals work. Include explanations supported by drawings, equations, or both. A range of reasonably efficient algorithms may be covered, not only the standard algorithm.	
Number Sense and Operations	5.NSO-C.15. Solve problems involving multiplication and division of any whole number.	Numbers – Base Ten	5-NBT.2. Explain why division strategies and algorithms work, using place value and the properties of operations. Include explanations supported by drawings,	

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			equations, or both. A range of reasonably efficient algorithms may be covered, not only the standard algorithm. 5-NBT.3. Use the standard algorithm to compute quotients of two-, three- and four-digit whole numbers and two-digit whole numbers, expressing the results as an equation (e.g., 145 = 11 x 13 + 2 or 120 x 7 = 17 1/7). 5-NBT.4. Fluently add, subtract and multiply whole numbers using the standard algorithm for each operation.	
Number Sense and Operations	5.NSO-C.16. Demonstrate proficiency with division, including division with positive decimals and long division with multidigit divisors.	Numbers – Base Ten	5-NBT.1. Compute quotients of two-, three-, and four-digit whole numbers and two-digit whole numbers using strategies based on place value, the properties of operations, and/or the inverse relationship between multiplication and division; explain the reasoning used. 5-NBT.12. Explain why strategies and algorithms for computations with finite decimals work. Include explanations supported by drawings, equations, or both. A range of reasonably efficient algorithms may be covered, not only the standard algorithm.	
Number Sense and Operations	5.NSO-C.17. Show an understanding of multiplication and division of fractions; multiply positive fractions with whole numbers.	Fractions	5-NF.6. Understand that multiplying a fraction by a/b means taking a parts of a decomposition of the fraction into b equal parts. For example, to multiply 2/3 x 4/5 = 8/15, one may decompose a whole of size 4/5 into 3 equal parts; each part has size 4/15. Two of these parts then make 8/15, so 2/3 x 4/5 = 8/15. (In general, a/b x p/q = ap/bq.) This standard includes multiplication of a whole number by a fraction, by writing the whole number as	

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			fraction with denominator 1. 5-NF.9. Understand division of unit fractions by whole numbers and division of whole numbers by unit fractions: a. Dividing a unit fraction 1/b by a whole number a results in a smaller unit fraction 1/a x b. For example, 1/3 ÷ 2 = 1/6 because when 1/3 is divided into 2 equal parts, the size of each part is 1/6; a third of a pound of cheese shared between two people will give each person a sixth of a pound. (Using the inverse relationship between multiplication and division: 1/3 ÷ 2 = 1/6 because 1/6 x 2 = 1/3.) b. Dividing a whole number a by a unit fraction 1/b results in a greater whole number a x b. For example, 2 ÷ 1/3 = 6 because 6 is the number of 1/3s in 2; two pounds of cheese will make six portions of a third of a pound each. (Using the inverse relationship between multiplication and division: 2 ÷ 1/3 = 6 because 6 x 1/3 = 2.) 5-NF.10. Calculate products of fractions, and quotients of unit fractions and nonzero whole numbers (with either as divisor), and solve word problems involving these operations. Represent these operations using equations, area models and length models.	
Number Sense and Operations	5.NSO-C.18. Simplify fractions in cases when both the numerator and the denominator have 2, 3, 4, 5, or 10 as a common factor. Show that two fractions are or are not equivalent by reducing to simpler forms or by finding a common	Fractions	5-NF.1. Understand fraction equivalence: a. Multiplying the numerator and denominator of a fraction by the same nonzero whole number produces an equivalent fraction. For example, 2/3 = (2 x 4)/(3 x 4) =	

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	denominator (e.g., show how 10/15 = 14/21).		8/12. (1/3 is 4 copies of 1/12, so 2/3 is 8 copies of 1/12.) b. Equivalent fractions correspond to the same point on a number line. In Grade 5, all numbers lines begin with zero. c. When the numerators of equivalent fractions are divided by their denominators, the resulting quotients are the same.	
Number Sense and Operations	5.NSO-C.19. Multiply positive decimals with whole numbers.	Numbers – Base Ten	5-NBT.13.Use the standard algorithm for each of the four operations on decimals (to hundredths). 5-NBT.11. Compute sums, differences, products, and quotients of finite decimals using strategies based on place value, the properties of operations, and/or the inverse relationships between addition and subtraction and between multiplication and division; explain the reasoning used. For example, transform 1.5 ÷ 0.3 into 15 ÷ 3 = 5. 5-NBT.12. Explain why strategies and algorithms for computations with finite decimals work. Include explanations supported by drawings, equations, or both. A range of reasonably efficient algorithms may be covered, not only the standard algorithm.	
Number Sense and Operations	5.NSO-C.20. Demonstrate an understanding of and compute (positive integer) powers of 10 (e.g., 10^2, 10^5); compute examples as repeated multiplication.			
Number Sense and Operations	5.NSO-C.21. Know integer subtraction is the inverse of integer addition; use the number line to model addition and	Number Sense	7-NS.2. Understand and perform addition and subtraction with rational numbers: a. Understand that on a number	

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	subtraction of integers and add and subtract integers, with the exception of subtracting negative integers.		line, the sum p + q is the number located a distance |q| from p, to the right of p if q is positive and to the left of p if q is negative. A number and its opposite are additive inverses (i.e., their sum is zero). b. Compute sums of signed numbers using the laws of arithmetic. For example, 7 + (–3) = 4 because 7 + (–3) = (4 + 3) + (–3) = 4 + [3 + (–3)] = 4 + [0] = 4. c. Understand that subtraction of rational numbers is defined by viewing a difference as the solution of an unknown-addend addition problem. Subtraction of a rational number gives the same answer as adding its additive inverse. d. Explain and justify rules for adding and subtracting rational numbers, using a number line and practical contexts. For example, relate r + (–s) = r – s to a bank transaction; explain why p – (q + r) = p – q – r. e. Understand that the additive inverse of a sum is the sum of the additive inverses, that is –(p + q) = –p + –q. For example, –(6 + –2) = (–6) + 2 because [6 + (–2)] + [(–6) + 2] = [6 + (–6)] + [(–2) + 2] = [0] + [0] = 0.	
Number Sense and Operations	5.NSO-C.22. Demonstrate an understanding of how parentheses affect expressions involving addition, subtraction, and multiplication, and use		3-NOP.2. Understand the properties of multiplication. d. Multiplication distributes over addition (the distributive	

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	that understanding to solve problems — e.g., 3 x (4 + 2) = 3 x 6.		property). For example, 5 x (3 + 4) = (5 x 3) + (5 x 4).	
Estimation				
Number Sense and Operations	5.NSO-E.23. Estimate sums and differences of whole numbers, positive fractions, and positive decimals. Estimate products of whole numbers and products of positive decimals with whole numbers. Use a variety of strategies and judge reasonableness of answers.			
Patterns, Relations, and Algebra				
Patterns, Relations, and Algebra	5.PRA.1. Analyze and determine the rules for extending symbolic, arithmetic, and geometric patterns and progressions (e.g., ABBCCC …; 1, 5, 9, 13, …; 3, 9, 27, …).			
Patterns, Relations, and Algebra	5.PRA.2. Replace variables with given values, evaluate, and simplify (e.g., 2(□) + 3 when □ = 4).	Expressions and Equations	6-EE. 1. Understand that an expression records operations with numbers or with letters standing for numbers. For example, the expression 2 x (8 + 7) records adding 8 and 7 then multiplying by 2; the expression 5 – y records subtracting y from 5. Focus on the operations of addition, subtraction, multiplication and division, with some attention to square or cube roots.	
Patterns, Relations, and Algebra	5.PRA.3. Use the properties of equality to solve problems with whole numbers (e.g., if x + 7 = 13, then x = 13 – 7, therefore x = 6; if 3 x □ = 15, then 1/3 x 3 x □ = 1/3 x 15, therefore □ = 5).	Numbers – Base Ten	5-NBT.3. Use the standard algorithm to compute quotients of two-, three- and four-digit whole numbers and two-digit whole numbers, expressing the results as an equation (e.g., 145 = 11 x 13 + 2 or 120 x 7 = 17 1/7).	
Patterns, Relations, and Algebra	5.PRA.4. Represent real situations and mathematical relationships with concrete models, tables, graphs, and rules in words and with symbols (e.g., input-output tables).			
Patterns, Relations, and	5.PRA.5. Interpret and evaluate mathematical expressions that use	Expressions and Equations	6-EE.3. Describe the structure and elements of simple expressions using	

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Algebra	parentheses; use parentheses to indicate which operation to perform first when writing expressions containing more than two terms and different operations.		correct terminology (sum, term, product, factor, quotient, coefficient); describe an expression by viewing one or more of its parts as a single entity. For example, describe the expression 2 x (8 + 7) as a product of two factors, by viewing (8 + 7) as a single entity. The second factor is itself a sum of two terms.	
Patterns, Relations, and Algebra	5.PRA.6. Solve problems involving proportional relationships using concrete models, tables, graphs, and paper-pencil methods.			
Patterns, Relations, and Algebra	5.PRA.7. Interpret graphs that represent the relationship between two variables in everyday situations.	Measurement and Data	5-MD.6. Make a dot plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in dot plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.	
Geometry				
Geometry	5.G.1. Identify polygons based on their properties, including types of interior angles, perpendicular or parallel sides, and congruence of sides (e.g., squares, rectangles, rhombuses, parallelograms, and trapezoids; isosceles, equilateral, and right triangles).	Geometry	5-G.3. Understand that properties belonging to a category of plane figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.	
Geometry	5.G.2. Identify, describe, and compare special types of three-dimensional shapes (e.g., cubes, prisms, spheres, cones, and pyramids) based on their properties, such as edges and faces.	Measurement and Data	5-MD.5. Decompose right rectangular prisms into layers of arrays of cubes; determine and compare volumes of right rectangular prisms, and objects well described as right rectangular prisms, by counting cubic units (using cm^3, m^3, in^3, ft^3,	

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			and improvised units). 6-G.4. Find the surface area of cubes, prisms and pyramids (include the use of nets to represent these figures). 6-G.5. Solve problems involving area, volume and surface area of objects.	
Geometry	5.G.3. Identify relationships among points, lines, and planes (e.g., intersecting, parallel, perpendicular).	Geometry	5-G.4. Classify plane figures in a hierarchy based on properties.	
Geometry	5.G.4. Identify and describe types of symmetry, including line and rotational.	Geometry	4-G.4. Understand that a line of symmetry for a geometric figure is a line across the figure such that the figure can be folded along the line into matching parts 4-G.5. Identify line-symmetric figures; given a horizontal or vertical line and a drawing that is not a closed figure, complete the drawing to create a figure that is symmetric with respect to the given line.	
Geometry	5.G.5. Determine if two triangles or two quadrilaterals are congruent by measuring sides or a combination of sides and angles.			
Geometry	5.G.6. Predict, describe, and perform transformations on two-dimensional shapes (e.g., translations, rotations, and reflections).			
Geometry	5.G.7. Graph points and identify coordinates of points on the Cartesian coordinate plane in the first two quadrants.	Geometry	5-G.1. Understand that a pair of perpendicular number lines, called axes, defines a coordinate system. a. Their intersection is called the origin, usually arranged to coincide with the 0 on each line. b. A given point in the plane can be located by using an ordered pair of numbers, called its coordinates. The first number indicates how far to travel from the origin in the direction of one	

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			axis, the second number indicates how far to travel in the direction of the second axis. c. To avoid ambiguity, conventions dictate that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). 5-G.2. Graph points in the first quadrant of the coordinate plane, and identify the coordinates of graphed points. Where ordered pairs arise in a problem situation, interpret the coordinate values in the context of the situation.	
Measurement				
Measurement	5.M.1. Apply the concepts of perimeter and area to the solution of problems involving triangles and rectangles. Apply formulas where appropriate.	Fractions	5-NF.7. Understand that the area of a rectangle with side lengths a/b and c/d is the product a/b x p/q. This extends the area formula for rectangles to fractional side lengths, and also allows products of fractions to be represented visually as areas of rectangles.	
Measurement	5.M.2. Apply formulas for the areas of triangles, rectangles, and parallelograms; recognize that shapes with the same number of sides but different appearances can have the same area.	Geometry	6-G.1. Understand that plane figures can be decomposed, reassembled, and completed into new figures; use this technique to derive area formulas.	
Measurement	5.M.3. Solve problems involving proportional relationships and units of measurement.		6-RP.5. Understand that for a ratio a:b, the corresponding unit rate is a/b. If there are a units of the first quantity for every b units of the second, where b ≠ 0, then there are a/b units of the first quantity for 1 unit of the second. For example, if a recipe has a ratio of 3 cups of flour to 4 cups of sugar, then there is 3/4 cup of flour for each cup of sugar. 6-RP.6. Solve unit rate problems including	

5th Grade				
	DC Math Standards		Common Core Standards	Comments
			unit pricing and constant speed, including reasoning with equations such as d = r x t, r = d/t, t = d x r.	
Measurement	5.M.4. Identify, measure, and describe circles and the relationships of the radius, diameter, circumference, and area (e.g., d = 2r), and use these concepts to solve problems.			
Measurement	5.M.5. Find volumes and surface areas of rectangular prisms.	Measurement and Data	5-MD.4. Understand concepts of volume measurement: a. A cube with side length 1 unit (a unit cube) is said to have "one cubic unit" of volume, and can be used to measure volume. b. The volume of a right rectangular prism with whole-unit side lengths can be found by packing it with unit cubes and using multiplication to count their number. For example, decomposing a right rectangular prism 3 length units wide by 5 units deep by 2 units tall shows that its volume is 3 x 5 x 2 cubic units. The base of the prism has area 3 x 5 square units, so the volume can also be expressed as the height times the area of the base. c. When measuring a volume, if a smaller unit is used, more units must be iterated to measure the volume in those units. d. If a solid figure is decomposed into several disjoint pieces, then the volume enclosed by the figure can be found by adding the volumes of the pieces (when these volumes are expressed in the same units). 5-MD.5. Decompose right rectangular prisms into layers of arrays of cubes; determine and compare volumes of right	

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	DC Math Standards		Common Core Standards	Comments
			rectangular prisms, and objects well described as right rectangular prisms, by counting cubic units (using cm^3, m^3, in^3, ft^3, and improvised units).	
Measurement	5.M.6. Know that angles on a straight line add up to 180°, interior angles of a triangle add up to 180°, angles surrounding a point add up to 360°, and interior angles of a quadrilateral add up to 360°; use these properties to solve problems.			
Measurement	5.M.7. Identify, measure, describe, classify, and draw various angles and triangles, given sides and the angle between them or given two angles and the side between them (e.g., draw a triangle with one right angle and two sides congruent).	Measurement and Data	4-MD.5. Understand what an angle is and how it is measured: a. An angle is formed by two rays with a common endpoint. b. An angle is measured by reference to a circle with its center at the common endpoint of the rays. The measure of an angle is based on the fraction of the circle between the points where the two rays intersect the circle. c. A one-degree angle turns through 1/360 of a circle, where the circle is centered at the common endpoint of its rays; the measure of a given angle is the number of one-degree angles turned with no gaps or overlaps. 4-MD.6. Measure angles in whole-number degrees using a protractor; sketch angles of specified measure; find the measure of a missing part of an angle, given the measure of the angle and the measure of a part of it, representing these problems with equations involving a letter for the unknown quantity.	
Data Analysis, Statistics, and Probability				

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	DC Math Standards		Common Core Standards	Comments
Data Analysis, Statistics, and Probability	5.DASP.1. Define and apply the concepts of mean to solve problems.		6-SP.2. Understand that a set of data generated by answers to a statistical question typically shows variability—not all of the values are the same—and yet often the values show an overall pattern, often with a tendency to cluster. a. A measure of center for a numerical data set summarizes all of its values using a single number. The median is a measure of center in the sense that approximately half the data values are less than the median, while approximately half are greater. The mean is a measure of center in the sense that it is the value that each data point would take on if the total of the data values were redistributed fairly, and in the sense that it is the balance point of a data distribution shown on a dot plot.	
Data Analysis, Statistics, and Probability	5.DASP.2. Construct, draw conclusions, and make predictions from various representations of data sets, including tables, line graphs, line plots, circle graphs, and bar graphs (where symbols or scales represent multiple units).		6-SP.3. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	
Data Analysis, Statistics, and Probability	5.DASP.3. Predict the probability of outcomes of simple experiments (e.g., tossing a coin, rolling a die) and test the predictions.		6-SP.2. Use proportional reasoning to predict relative frequencies of outcomes for situations involving randomness, but for which a theoretical answer can be determined. For example, when rolling a number cube 600 times, one would predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. How far off might your prediction be? Use technology to generate multiple samples to approximate a distribution of sample proportions. Repeat the process for	

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			smaller sample sizes.	
		Measurement and Data	5-MD.1. Understand that quantities expressed in like units can be added or subtracted giving a sum or difference with the same unit; different quantities may be multiplied to obtain a new kind of quantity (e.g., as when two lengths are multiplied to compute an area, or when an area and a length are multiplied to compute a volume).	
		Measurement and Data	5-MD.2. Understand that when measuring a quantity, if a smaller unit is used, more units must be iterated to measure the quantity in those units.	
		Numbers – Base Ten	5-NBT.10. Compute sums and differences of finite decimals by expressing the decimals as fractions and adding the fractions. For example, 0.05 + 0.91 = 5/100 + 91/100 = 96/100 or 0.96.	

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Number Sense				
Number Sense and Operations	6.NSO-N.1. Explain the properties of and compute with rational numbers, expressed in a variety of forms.	Number System	6-NS.1. Understand that the properties of operations apply to, and can be used with, addition and multiplication of fractions. 6-NS.4. Fluently divide whole numbers using the standard algorithm.	
Number Sense and Operations	6.NSO-N.2. Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.	Number System	6-NS.5. Understand that a number is a point on the number line. 6-NS.7. Understand that number lines familiar from previous grades can be extended to represent negative numbers to the left of zero. Number lines can also be vertically oriented, as when a coordinate system is formed. Then the conventional terms "to the right of 0" and "to the left of 0" conventionally become "above 0" and "below 0." a. Two different numbers, such as 7 and –7, that are equidistant from zero on a number line are said to be opposites of one another. The opposite of the opposite of a number is the number itself, e.g., –(–3) = 3. The opposite of 0 is 0. 6-NS.8. Find and position rational numbers, including integers, on a number line. 6-NS.9. Use rational numbers to describe quantities such as elevation, temperature, account balance and so on. Compare these quantities, recording the results of comparisons using > and < symbols.	
Number Sense and Operations	6.NSO-N.3. Know that numbers and their opposites add to 0 and are on opposite sides and at equal distance from 0 on a number line; know that 0 is an integer that is neither negative nor positive.	Number System	6-NS.7. Understand that number lines familiar from previous grades can be extended to represent negative numbers to the left of zero. Number lines can also be vertically oriented, as when a	

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			coordinate system is formed. Then the conventional terms "to the right of 0" and "to the left of 0" conventionally become "above 0" and "below 0." a. Two different numbers, such as 7 and –7, that are equidistant from zero on a number line are said to be opposites of one another. The opposite of the opposite of a number is the number itself, e.g., –(–3) = 3. The opposite of 0 is 0.	
Number Sense and Operations	6.NSO-N.4. Represent rational numbers as repeating or terminating decimals when possible, and translate between these representations.			
Number Sense and Operations	6.NSO-N.5. Identify and determine common equivalent fractions, mixed numbers, decimals, and percentages.	Fractions	5-NF.1. Understand fraction equivalence: a. Multiplying the numerator and denominator of a fraction by the same nonzero whole number produces an equivalent fraction. For example, 2/3 = (2 x 4)/(3 x 4) = 8/12. (1/3 is 4 copies of 1/12, so 2/3 is 8 copies of 1/12.) b. Equivalent fractions correspond to the same point on a number line. In Grade 5, all numbers lines begin with zero. c. When the numerators of equivalent fractions are divided by their denominators, the resulting quotients are the same. 5-NF.2. Identify pairs of equivalent fractions; given two fractions with unlike denominators, find two fractions with the same denominator and equivalent to each.	
Number Sense and Operations	6.NSO-N.6. Apply number theory concepts — including prime and composite numbers; prime factorization;			

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	greatest common factor; least common multiple; and divisibility rules for 2, 3, 4, 5, 6, 9, and 10 — to the solution of problems.			
Number Sense and Operations	6.NSO-N.7. Round whole numbers and decimals to any given place.	Numbers – Base Ten	5-NBT.6. Round decimals (to hundredths) to the nearest whole number.	
Computations and Operations				
Number Sense and Operations	6.NSO-C.8. Select and use appropriate operations to solve problems involving addition, subtraction, multiplication, division, and positive integer exponents with whole numbers and with positive fractions, mixed numbers, decimals, and percentages.	Proportions and Relationships	6-RP.2. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. 6-RP.4. Describe categorical data sets using ratios (e.g., for every vote candidate A received, candidate C received nearly three votes; the ratio of type O blood donors to type B blood donors was 9:2).	
Number Sense and Operations	6.NSO-C.9. Know integer subtraction is the inverse of integer addition; use the number line to model addition and subtraction of integers and add and subtract integers.	Number System	7-NS.2. Understand and perform addition and subtraction with rational numbers: a. Understand that on a number line, the sum p + q is the number located a distance |q| from p, to the right of p if q is positive and to the left of p if q is negative. A number and its opposite are additive inverses (i.e., their sum is zero).	
Number Sense and Operations	6.NSO-C.10. Accurately and efficiently add, subtract, multiply, and divide (with multidigit divisors) whole numbers and positive decimals.	Numbers – Base Ten	5-NBT.11. Compute sums, differences, products, and quotients of finite decimals using strategies based on place value, the properties of operations, and/or the inverse relationships between addition and subtraction and between multiplication and division; explain the reasoning used. For example, transform 1.5 x 0.3 into 15 ÷ 3 = 5.	
Number Sense and Operations	6.NSO-C.11. Use prime factorization to add and subtract fractions with like and unlike denominators.	Fractions	5-NF.4. Understand that sums and differences of fractions with unlike denominators can be computed by	

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			replacing each with an equivalent fraction so that the resulting fractions have the same denominator. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. 5-NF.5. Compute sums and differences of fractions with like or unlike denominators, and solve word problems involving addition and subtraction of fractions. Estimate fraction sums and differences to assess the reasonableness of results.	
Number Sense and Operations	6.NSO-C.12. Accurately and efficiently add, subtract, multiply, and divide positive fractions (including mixed numbers) with like and unlike denominators. Simplify fractions.	Fractions	5-NF.5. Compute sums and differences of fractions with like or unlike denominators, and solve word problems involving addition and subtraction of fractions. Estimate fraction sums and differences to assess the reasonableness of results. 5-NF.10. Calculate products of fractions, and quotients of unit fractions and nonzero whole numbers (with either as divisor), and solve word problems involving these operations. Represent these operations using equations, area models and length models.	
Number Sense and Operations	6.NSO-C.13. Calculate given percentages of quantities, and solve problems involving discounts at sales, interest earned, and tips.	Proportions and Relationships	7-RP.6. Understand that percentages are rates per 100. For example, 30% of a quantity means 30/100 times the quantity. A percentage can be a complex fraction, as in 3.75% = 3.75/100. 7-RP.7. Find a percentage of a quantity; solve problems involving finding the whole given a part and the percentage. 7-RP.8. Solve multi-step percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error, expressing monthly rent as a percentage of take-home pay.	
Number Sense	6.NSO-C.14. Solve simple proportion	Proportions	6-RP.1. Understand the concept of a ratio:	

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and Operations	problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation a/b = c/d.	and Relationships	Two quantities are said to be in a ratio of a to b when for every a units of the first quantity there are b units of the second. For example, in a flock of birds, the ratio of wings to beaks might be 2 to 1; this ratio is also written 2:1. In Grade 6, limit to ratios of whole numbers. 6-RP.5. Understand that for a ratio a:b, the corresponding unit rate is a/b. If there are a units of the first quantity for every b units of the second, where b ≠ 0, then there are a/b units of the first quantity for 1 unit of the second. For example, if a recipe has a ratio of 3 cups of flour to 4 cups of sugar, then there is 3/4 cup of flour for each cup of sugar. 6-RP.6. Solve unit rate problems including unit pricing and constant speed, including reasoning with equations such as d = r x t, r = d/t, t = d x r.	
Number Sense and Operations	6.NSO-C.15. Apply laws of exponents to multiply whole number powers with like bases.			
Number Sense and Operations	6.NSO-C.16. Understand multiplication of a negative number by a positive integer as repeated addition.	Number System	7-NS.3. Understand and perform multiplication and division with rational numbers: a. Understand that the extension of multiplication from fractions to rational numbers is determined by the requirement that multiplication and addition satisfy the laws of arithmetic, particularly the distributive law, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers.	
Number Sense and Operations	6.NSO-C.17. Apply the Order of Operations for expressions involving addition, subtraction, multiplication, and	Expressions and Equations	6-EE.1. Understand that an expression records operations with numbers or with letters standing for numbers. For example,	

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	division with grouping symbols.		the expression 2 x (8 + 7) records adding 8 and 7 then multiplying by 2; the expression 5 – y records subtracting y from 5. Focus on the operations of addition, subtraction, multiplication and division, with some attention to square or cube roots.	
Estimation				
Number Sense and Operations	6.NSO-E.18. Estimate results of computations with whole numbers and with positive fractions, mixed numbers, decimals, and percentages. Determine reasonableness of estimates.			
Patterns, Relations, and Algebra, continued				
Patterns, Relations, and Algebra	6.PRA.1. Use the properties of equality to solve problems using letter name variables (e.g., 1/4 + x = 7/12).	Expressions and Equations	6-EE.6. Using the idea of maintaining equality between both sides of the equation, solve equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.	
Patterns, Relations, and Algebra	6.PRA.2. Write and solve one-step linear equations and check the answers.	Expressions and Equations	6-EE.1. Understand that an expression records operations with numbers or with letters standing for numbers. For example, the expression 2 x (8 + 7) records adding 8 and 7 then multiplying by 2; the expression 5 – y records subtracting y from 5. Focus on the operations of addition, subtraction, multiplication and division, with some attention to square or cube roots. 6-EE.2. Understand the use of variables in expressions and algebraic conventions: a. A letter is used to stand for a number in an expression in cases where the number is unknown, or where, for the purpose at hand, it can be any number in a domain of interest. Such a letter is called a variable. b. If a variable appears in an expression more than once (e.g.,	

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			as in t + 3t), that variable is understood to refer to the same number in each instance. c. The multiplication symbol can be omitted when writing products of two or more variables or of a number and a variable. For example, the expressions xy and 2a indicate x x y and 2 x a, respectively. 6-EE.3. Describe the structure and elements of simple expressions using correct terminology (sum, term, product, factor, quotient, coefficient); describe an expression by viewing one or more of its parts as a single entity. For example, describe the expression 2 x (8 + 7) as a product of two factors, by viewing (8 + 7) as a single entity. The second factor is itself a sum of two terms. 6-EE.7. Choose variables to represent quantities in a word problem, and construct simple expressions or equations to solve the problem by reasoning about the quantities.	
Patterns, Relations, and Algebra	6.PRA.3. Identify and describe relationships between two variables with a constant rate of change (e.g., perimeter-side relationship for a square, distance-time graphs, and conversions such as feet to inches). Contrast these with relationships where the rate of change is not constant.	Expressions and Equations	6-EE.4. Understand and generate equivalent expressions: a. Understand that two expressions are equivalent if they name the same number regardless of which numbers the variables in them stand for. For example, the expressions x + 3 and 4x are not equivalent, even though they happen to name the same number in the case when x stands for 1. b. Understand that applying the	

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			laws of arithmetic to an expression results in an equivalent expression. For example, applying the distributive law to the expression 3 x (2 + x) leads to the equivalent expression 6 + 3x. Applying the distributive law to y + y + y leads to the equivalent expression y x (1 + 1 + 1), i.e., y x 3 and then the commutative law of multiplication leads to the equivalent expression 3y. c. Generate equivalent expressions to reinterpret the meaning of an expression. For example, 2t + 3t records the addition of twice a quantity to three times itself; applying the distributive law leads to the equivalent expression 5t, so that the original expression can be reinterpreted as recording five times the quantity. 6-EE.5. Understand that an equation is a statement that two expressions are equal, and a solution to an equation is a replacement value of the variable (or replacement values for all the variables if there is more than one) that makes the equation true.	
Patterns, Relations, and Algebra	6.PRA.4. Simplify expressions of the first degree by combining like terms, and evaluate using specific values.	Expressions and Equations	6-EE.4. Understand and generate equivalent expressions: c. Generate equivalent expressions to reinterpret the meaning of an expression. For example, 2t + 3t records the addition of twice a quantity to three times itself; applying the distributive law leads to the	

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			equivalent expression 5t, so that the original expression can be reinterpreted as recording five times the quantity.	
Patterns, Relations, and Algebra	6.PRA.5. Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same truth values.	Expressions and Equations	6-EE.6. Using the idea of maintaining equality between both sides of the equation, solve equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.	
Patterns, Relations, and Algebra	6.PRA.6. Understand that multiplying or dividing both sides of an equation by the same nonzero number creates a new equation that has the same truth values.	Expressions and Equations	6-EE.6. Using the idea of maintaining equality between both sides of the equation, solve equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.	
Patterns, Relations, and Algebra	6.PRA.7. Distinguish between an algebraic expression and an equation.	Expressions and Equations	6-EE.5. Understand that an equation is a statement that two expressions are equal, and a solution to an equation is a replacement value of the variable (or replacement values for all the variables if there is more than one) that makes the equation true.	
Patterns, Relations, and Algebra	6.PRA.8. Recognize when information given in a table, graph, or formula suggests a proportional or linear relationship.	Expressions and Equations	6-EE.8. Understand that a variable can be used to represent a quantity that can change, often in relationship to another changing quantity, and an equation can express one quantity, thought of as the dependent variable, in terms of other quantities, thought of as the independent variables; represent a relationship between two quantities using equations, graphs, and tables; translate between any two of these representations. For example, describe the terms in a sequence t = 3, 6, 9, 12, ... of multiples of 3 by writing the equation t = 3n for n = 1, 2, 3, 4, ….	
Patterns, Relations, and Algebra	6.PRA.9. Produce and interpret graphs that represent the relationship between two variables (x and y) in everyday situations.	Expressions and Equations	6-EE.8. Understand that a variable can be used to represent a quantity that can change, often in relationship to another changing quantity, and an equation can express one quantity, thought of as the	

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			dependent variable, in terms of other quantities, thought of as the independent variables; represent a relationship between two quantities using equations, graphs, and tables; translate between any two of these representations. For example, describe the terms in a sequence t = 3, 6, 9, 12, ... of multiples of 3 by writing the equation t = 3n for n = 1, 2, 3, 4, ….	
Geometry				
Geometry	6.G.1. Match three-dimensional objects and their two-dimensional representations (e.g., nets, projections, and perspective drawings).	Geometry	6-G.3. Understand that three-dimensional figures can be formed by joining rectangles and triangles along their edges to enclose a solid region with no gaps or overlaps. The surface area is the sum of the areas of the enclosing rectangles and triangles.	
Geometry	6.G.2. Identify angles as vertical, adjacent, complementary, or supplementary; provide descriptions of these terms; and use the properties of complementary and supplementary angles and the sum of the angles of a triangle to solve problems involving an unknown angle.	Geometry	7-G.8. Justify facts about the angle sum of triangles, exterior angles, and alternate interior angles created when parallel lines are cut by a transversal, e.g., by using physical models, transparencies, or dynamic geometry software to make rigid motions and give informal arguments. For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so. 7-G.9. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	
Geometry	6.G.3. Determine if two shapes are congruent by motions or series of motions (e.g., translations, rotations, and reflections); predict the results of transformations on unmarked planes and draw the transformed figure (e.g., predict how tessellations transform	Geometry	7-G.3. Verify experimentally that a dilation with scale factor k preserves lines and angle measure, but takes a line segment of length L to a line segment of length kL. 7-G.4. Understand the meaning of similarity: a plane figure is similar to another if the second can be obtained	

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	under translation, reflection, and rotation).		from the first by a similarity transformation (a rigid motion followed by a dilation). 7-G.5. Solve problems involving similar figures and scale drawings. Include computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	
Geometry	6.G.4. Graph points and identify coordinates of points on the Cartesian coordinate plane in all four quadrants.	Number Sense	6-NS.10. Graph points and identify coordinates of points on the coordinate plane in all four quadrants. Where ordered pairs arise in a problem situation, interpret the coordinate values in the context of the situation. Expressions and Equations	
Geometry	6.G.5. Find the distance between two points on horizontal or vertical number lines.			
Measurement				
Measurement	6.M.1. Differentiate between and use appropriate units of measures for two- and three-dimensional objects (i.e., when finding perimeter, area, and volume).	Geometry	6-G.5. Solve problems involving area, volume and surface area of objects.	
Measurement	6.M.2. Find areas of triangles and parallelograms. Recognize that shapes with the same number of sides but different appearances can have the same area.	Geometry	6-G.2. Find the areas enclosed by right triangles, other triangles, special quadrilaterals, and polygons (by composing into rectangles or decomposing into triangles and other shapes). 6-G.5. Solve problems involving area, volume and surface area of objects.	
Measurement	6.M.3. Develop strategies to find the area and perimeter of complex shapes (e.g., subdividing them into basic shapes such as quadrilaterals, triangles, circles).	Geometry	6-G.1. Understand that plane figures can be decomposed, reassembled, and completed into new figures; use this technique to derive area formulas.	
Measurement	6.M.4. Solve problems involving proportional relationships and units of measurement (e.g., same system unit	Proportions and Relationships	7-RP.1. Form ratios of nonnegative rational numbers and compute corresponding unit rates. For example, a person might walk ½	

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	conversions, scale models, maps, and speed).		mile in each ¼ hour; the unit rate for this ratio is (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. Include ratios of lengths, areas and other quantities, including when quantities being compared are measured in different units. 7-RP.3. Compute unit rates and solve proportional relationship problems in everyday contexts, such as shopping, cooking, carpentry, party planning, etc. Represent proportional relationships by equations that express how the quantities are related via the constant of proportionality or unit rate. For example, total cost, t, is proportional to the number, n, purchased at a constant price, p; this relationship can be expressed as t = pn.	
Measurement	6.M.5. Understand the concept of volume; use the appropriate units in common measuring systems (e.g., cubic inch, cubic centimeter, cubic meter, cubic yard) to compute the volume of rectangular solids, including rectangular prisms.	Geometry	6-G.5. Solve problems involving area, volume and surface area of objects.	
Measurement	6.M.6. Identify, measure, describe, classify, and construct various angles, triangles, and quadrilaterals; measure the interior angles of various polygons.	Geometry	7-G.8. Justify facts about the angle sum of triangles, exterior angles, and alternate interior angles created when parallel lines are cut by a transversal, e.g., by using physical models, transparencies, or dynamic geometry software to make rigid motions and give informal arguments. For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so. 7-G.9. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown	

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	DC Math Standards		Common Core Standards	Comments
			angle in a figure.	
Measurement	6.M.7. Understand the concept of the constant □; know the formulas for the circumference and area of a circle. Use the concepts to solve problems.	Geometry	6-G.5. Solve problems involving area, volume and surface area of objects.	
Measurement	6.M.8. Know and use the formulas for the volumes and surface areas of cubes and rectangular prisms, given the lengths of their sides.	Geometry	6-G.4. Find the surface area of cubes, prisms and pyramids (include the use of nets to represent these figures). 6-G.5. Solve problems involving area, volume and surface area of objects. 6-G.6. Give examples of right rectangular prisms with the same surface area and different volumes, and with the same volume and different surface areas.	
Measurement	6.M.9. Find the sum of the angles in simple polygons (up to eight sides) with and without measuring the angles.	Geometry	7-G.8. Justify facts about the angle sum of triangles, exterior angles, and alternate interior angles created when parallel lines are cut by a transversal, e.g., by using physical models, transparencies, or dynamic geometry software to make rigid motions and give informal arguments. For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so.	
Data Analysis, Statistics, and Probability				
Data Analysis, Statistics, and Probability	6.DASP.1. Describe and compare data sets using the concepts of median, mean, mode, maximum and minimum, and range.	Statistics and Probability	6-SP.2. Understand that a set of data generated by answers to a statistical question typically shows variability—not all of the values are the same—and yet often the values show an overall pattern, often with a tendency to cluster. a. A measure of center for a numerical data set summarizes all of its values using a single number. The median is a measure of center in the sense that approximately half the data	

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			values are less than the median, while approximately half are greater. The mean is a measure of center in the sense that it is the value that each data point would take on if the total of the data values were redistributed fairly, and in the sense that it is the balance point of a data distribution shown on a dot plot. b. A measure of variation for a numerical data set describes how its values vary using a single number. The interquartile range and the mean absolute deviation are both measures of variation. 6-SP.5. Relate the choice of the median or mean as a measure of center to the shape of the data distribution being described and the context in which it is being used. Do the same for the choice of interquartile range or mean average deviation as a measure of variation. For example, why are housing prices often summarized by reporting the median selling price, while students' assigned grades are often based on mean homework scores?	
Data Analysis, Statistics, and Probability	6.DASP.2. Construct circle graphs using ratios, proportions, and percentages.	Statistics and Probability	6-SP.3. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	
Data Analysis, Statistics, and Probability	6.DASP.3. Construct, label, and interpret stem-and-leaf plots.	Statistics and Probability	6-SP.3. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	
Data Analysis, Statistics, and Probability	6.DASP.4. Use tree diagrams and other models (e.g., lists and tables) to represent possible or actual outcomes of trials.	Statistics and Probability	6-SP.3. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	
Data Analysis, Statistics, and	6.DASP.5. Represent two numerical variables on a scatterplot, and describe	Statistics and Probability	6-SP.3. Display numerical data in plots on a number line, including dot plots,	

6th Grade				
	DC Math Standards		Common Core Standards	Comments
Probability	any apparent relationship that exists between the two variables (e.g., between time spent on homework and grades in class).		histograms, and box plots.	
Data Analysis, Statistics, and Probability	6.DASP.6. Compute probabilities of events from simple experiments with equally likely outcomes (e.g., tossing dice, flipping coins, spinning spinners) by listing all possibilities and finding the fraction that meets given conditions. Analyze the outcomes.		7-SP.1. Simulate situations involving randomness using random numbers generated by a calculator or a spreadsheet or taken from a table. For example, if you guess at all ten true/false questions on a quiz, how likely are you to get at least seven answers correct? 7-SP.2. Use proportional reasoning to predict relative frequencies of outcomes for situations involving randomness, but for which a theoretical answer can be determined. For example, when rolling a number cube 600 times, one would predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. How far off might your prediction be? Use technology to generate multiple samples to approximate a distribution of sample proportions. Repeat the process for smaller sample sizes.	
Data Analysis, Statistics, and Probability	6.DASP.7. Use appropriate ratios between 0 and 1 to represent the probability of the outcome and associate the probability with the likelihood of the event; know that 0 probability means an event will not occur and that a probability of 1 means an event will occur.			
		Number System	6-NS.2. Understand that division of fractions is defined by viewing a quotient as the solution for an unknown-factor multiplication problem. For example, (2/3) x (5/7) = 14/15 because (5/7) x (14/15) = (2/3).	
		Statistics and	6-SP.1. Understand that a statistical	

6th Grade				
	DC Math Standards		Common Core Standards	Comments
		Probability	question is one that anticipates variability in the data related to the question and accounts for it in the answers. For example, “How old am I?” is not a statistical question , but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages.	
		Statistics and Probability	6-SP.4. Summarize numerical data sets, such as by: a. Reporting the number of observations. b. Describing the nature of the variable, including how it was measured and its units of measurement. Data sets can include fractional values at this grade but not negative values. c. Describing center and variation, as well as describing any overall pattern and any striking deviations from the overall pattern.	

7th Grade				
	DC Math Standards		Common Core Standards	Comments
Number Sense				
Number Sense and Operations	7.NSO-N.1. Compare, order, estimate, and translate among integers, fractions, mixed numbers (i.e., rational numbers), decimals, and percents.	Proportions and Relationships	7-RP.6. Understand that percentages are rates per 100. For example, 30% of a quantity means 30/100 times the quantity. A percentage can be a complex fraction, as in 3.75% = 3.75/100.	
Number Sense and Operations	7.NSO-N.2. Know that in decimal form, rational numbers either terminate or eventually repeat; locate rational numbers on the number line; convert between common repeating decimals and fractions.			
Number Sense and Operations	7.NSO-N.3. Know the concept of absolute value (e.g., |–3| = |3| = 3).	Number System	6-NS.6. Understand that some quantities have opposite directions, such as elevation above and below sea level or money received and spent. These quantities can be described using positive and negative numbers. 6-NS.7. Understand that number lines familiar from previous grades can be extended to represent negative numbers to the left of zero. Number lines can also be vertically oriented, as when a coordinate system is formed. Then the conventional terms "to the right of 0" and "to the left of 0" conventionally become "above 0" and "below 0." b. The absolute value of a number q, written |q|, is its distance from zero, and is always positive or zero.	
Number Sense and Operations	7.NSO-N.4. Represent numbers in scientific notation (positive powers of 10 only), and use that notation in problem situations.			
Number Sense	7.NSO-N.5. Differentiate between	Number	6-NS.7. Understand that number lines	

7th Grade				
	DC Math Standards		Common Core Standards	Comments
and Operations	rational and irrational numbers (i.e., know that irrational numbers cannot be expressed as the quotient of two integers and cannot be represented by terminating or repeating decimals).	System	familiar from previous grades can be extended to represent negative numbers to the left of zero. Number lines can also be vertically oriented, as when a coordinate system is formed. Then the conventional terms "to the right of 0" and "to the left of 0" conventionally become "above 0" and "below 0." c. Fractions and their opposites form a system of numbers called the rational numbers, represented by points on a number line. Whole numbers and their opposites form the integers, which are contained in the rational numbers.	
Number Sense and Operations	7.NSO-N.6. Interpret positive whole-number powers as repeated multiplication and negative powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.		7-EE.1. Interpret numerical expressions at a level necessary to calculate their value using a calculator or spreadsheet. For expressions with variables, use and interpret conventions of algebraic notation, such as y/2 is y ÷ 2 or 1/2 × y; (3 ± y)/5 is (3 ± y) ÷ 5 or 1/5 × (3 ± y); a^2 is a × a, a^3 is a × a × a, a^2b is a × a × b.	
Number Sense and Operations	7.NSO-N.7. Apply number theory concepts, including prime factorization and relatively prime numbers, to the solution of problems (e.g., find the prime factorization of whole numbers, and write the results using exponents: 24 = 2 x 2 x 2 x 3 = 2^3 x 3).			
Number Sense and Operations	7.NSO-N.8. Express ratios in several ways (e.g., 3 cups to 5 people; 3:5; 3/5); recognize and find equivalent ratios.	Proportions and Relationships	6-RP.1. Understand the concept of a ratio: Two quantities are said to be in a ratio of a to b when for every a units of the first quantity there are b units of the second. For example, in a flock of birds, the ratio of wings to beaks might be 2 to 1; this ratio is also written 2:1. In Grade 6, limit to ratios of whole numbers.	

7th Grade				
	DC Math Standards		Common Core Standards	Comments
Number Sense and Operations	7.NSO-N.9. Know the meaning of a square root of a number and its connection to the square whose area is the number.	Geometry	6-G.7. Use exponents and symbols for square roots and cube roots to express the area of a square and volume of a cube in terms of their side lengths, and to express their side lengths in terms of their area or volume.	
Computations and Operations				
Number Sense and Operations	7.NSO-C.10. Compute with fractions (including simplification of fractions), integers, decimals, and percentages (including those greater than 100 and less than 1) using the four operations and combinations of the four operations.	Number System	6-NS.3. Solve word problems requiring arithmetic with fractions, using the properties of operations and converting between forms as appropriate; estimate to check reasonableness of answers. 7-RP.7. Find a percentage of a quantity; solve problems involving finding the whole given a part and the percentage. 7-RP.8. Solve multi-step percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error, expressing monthly rent as a percentage of take-home pay.	
Number Sense and Operations	7.NSO-C.11. Demonstrate an understanding of the properties of arithmetic operations on rational numbers (integers, fractions, and terminating decimals); convert terminating decimals into reduced fractions.	Number System	7-NS.1. Understand that the rules for manipulating fractions extend to complex fractions. 7-NS.2. Understand and perform addition and subtraction with rational numbers: a. Understand that on a number line, the sum p + q is the number located a distance |q| from p, to the right of p if q is positive and to the left of p if q is negative. A number and its opposite are additive inverses (i.e., their sum is zero). b. Compute sums of signed numbers using the laws of arithmetic. For example, 7 + (–3) =	

7th Grade				
	DC Math Standards		Common Core Standards	Comments
			4 because 7 + (–3) = (4 + 3) + (–3) = 4 + [3 + (–3)] = 4 + [0] = 4. c. Understand that subtraction of rational numbers is defined by viewing a difference as the solution of an unknown-addend addition problem. Subtraction of a rational number gives the same answer as adding its additive inverse. d. Explain and justify rules for adding and subtracting rational numbers, using a number line and practical contexts. For example, relate r + (–s) = r – s to a bank transaction; explain why p – (q + r) = p – q – r. e. Understand that the additive inverse of a sum is the sum of the additive inverses, that is –(p + q) = –p + –q. For example, –(6 + –2) = (–6) + 2 because [6 + (–2)] + [(–6) + 2] = [6 + (–6)] + [(–2) + 2] = [0] + [0] = 0. 7-NS.3. Understand and perform multiplication and division with rational numbers: a. Understand that the extension of multiplication from fractions to rational numbers is determined by the requirement that multiplication and addition satisfy the laws of arithmetic, particularly the distributive law, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. b. Understand that integers can	

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	DC Math Standards		Common Core Standards	Comments
			be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p/q is a rational number, then –(p/q) = (–p)/q = p/(–q).	
Number Sense and Operations	7.NSO-C.12. Select and use appropriate operations — addition, subtraction, multiplication, division — to solve problems with rational numbers and negative integers.	Number System	7-NS.3. Understand and perform multiplication and division with rational numbers: c. Calculate products and quotients of rational numbers, and use multiplication and division to solve word problems. Include signed quantities.	
Number Sense and Operations	7.NSO-C.13. Calculate the percentage increase and decrease of a quantity.	Proportions and Relationships	7-RP.7. Find a percentage of a quantity; solve problems involving finding the whole given a part and the percentage.	
	7.NSO-C.14. Use ratios and proportions in the solution of problems involving unit rates, scale drawings, and reading of maps.	Proportions and Relationships	7-RP.1. Form ratios of nonnegative rational numbers and compute corresponding unit rates. For example, a person might walk ½ mile in each ¼ hour; the unit rate for this ratio is (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. Include ratios of lengths, areas and other quantities, including when quantities being compared are measured in different units. 7-RP.2. Recognize situations in which two quantities covary and have a constant ratio. (The quantities are then said to be in a proportional relationship and the unit rate is called the constant of proportionality.) Decide whether two quantities that covary are in a proportional relationship, e.g., by testing for equivalent ratios or graphing on a coordinate plane.	
Number Sense and Operations	7.NSO-C.15. Take positive and negative rational numbers to positive whole number powers.			

7th Grade				
	DC Math Standards		Common Core Standards	Comments
Number Sense and Operations	7.NSO-C.16. Apply the laws of exponents to multiply whole number positive and negative powers of whole numbers; divide whole number powers with like bases; explain the inverse relationship between negative and positive exponents.			
Number Sense and Operations	7.NSO-C.17. Use the inverse relationships of addition/subtraction and multiplication/division to simplify computations and solve problems (e.g., multiplying by 1/2 or 0.5 is the same as dividing by 2).	Numbers – Base Ten	1-NBT.3. Understand that addition and subtraction have an inverse relationship. For example, if 8 + 2 = 10 is known, then 10 – 2 = 8 and 10 – 8 = 2 are also known. 3-NBT.4. Understand that multiplication and division have an inverse relationship. For example, if 5 x 7 = 35 is known, then 35 x 5 = 7 and 35 x 7 = 5 are also known. The division 35 x 5 means the number which yields 35 when multiplied by 5; because 5 x 7 = 35, then 35 x 5 = 7. 5-NBT.1. Compute quotients of two-, three-, and four-digit whole numbers and two-digit whole numbers using strategies based on place value, the properties of operations, and/or the inverse relationship between multiplication and division; explain the reasoning used.	
Number Sense and Operations	7.NSO-C.18. Use the associative, commutative, and distributive properties; properties of the identity and inverse elements (e.g., –7 + 7 = 0; 3/4 x 4/3 = 1).	Numbers – Base Ten	4-NBT.3. Understand how the distributive property and the expanded form of a multi-digit number can be used to calculate products of multi-digit numbers. a. The product of a one-digit number times a multi-digit number is the sum of the products of the one-digit number with the summands in the expanded form of the multi-digit number. Illustrate this numerically and visually using equations, rectangular arrays, area models, and tape diagrams.	

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	DC Math Standards		Common Core Standards	Comments
			b. Algorithms for multi-digit multiplication can be derived and explained by writing multi-digit numbers in expanded form and applying the distributive property.	
Number Sense and Operations	7.NSO-C.19. Know and apply the Order of Operations rules to expressions involving powers and roots.			
Estimation				
Number Sense and Operations	7.NSO-E.20. Estimate results of computations with rational numbers; determine estimates to a certain stated accuracy.			
	Patterns, Relations, and Algebra			
Patterns, Relations, and Algebra	7.PRA.1. Extend, represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic expressions. Include arithmetic and geometric progressions (e.g., compounding).	Proportions and Relationships	7-RP.5. Compare tables, graphs, formulas, diagrams, and verbal descriptions that represent or partially represent proportional relationships; explain correspondences among the representations including how the unit rate is shown in each.	
Patterns, Relations, and Algebra	7.PRA.2. Evaluate simple algebraic expressions for given variable values (e.g., 3a2 – b for a = 3 and b = 7).	Expressions and Equations	7-EE.1. Interpret numerical expressions at a level necessary to calculate their value using a calculator or spreadsheet. For expressions with variables, use and interpret conventions of algebraic notation, such as y/2 is y ÷ 2 or 1/2 × y; (3 ± y)/5 is (3 ± y) ÷ 5 or 1/5 × (3 ± y); a^2 is a × a, a^3 is a × a × a, a^2b is a × a × b.	
Patterns, Relations, and Algebra	7.PRA.3. Use the correct order of operations to evaluate expressions (e.g., 3(2x) = 5).	Statistics and Probability	7-SP.3. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	
Patterns,	7.PRA.4. Create and use symbolic	Expressions	8-EE.5. Understand that the graph of a	

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	DC Math Standards		Common Core Standards	Comments
Relations, and Algebra	expressions for linear relationships, and relate them to verbal and graphical representations.	and Equations	linear equation in two variables is a line, the set of pairs of numbers satisfying the equation. If the equation is in the form y = mx + b, the graph can be obtained by shifting the graph of y =mx by b units (upwards if b is positive, downwards if b is negative). The slope of the line is m.	
Patterns, Relations, and Algebra	7.PRA.5. Use variables and appropriate operations to write an expression, equation, or inequality that represents a verbal description (e.g., 3 less than a number, 1/2 as large as area A).	Expressions and Equations	7-EE.3. Choose variables to represent quantities in a word problem, and construct simple equations to solve the problem by reasoning about the quantities. b. Solve the same word problem arithmetically and algebraically. For example, "J. has 4 packages of balloons and 5 single balloons. In all, he has 21 balloons. How many balloons are in a package?" Solve this problem arithmetically (using a sequence of operations on the given numbers), and also solve it by using a variable to stand for the number of balloons in a package, constructing an equation such as 4b + 5 = 21 to describe the situation then solving the equation.	
Patterns, Relations, and Algebra	7.PRA.6. Write and solve two-step linear equations and check the answers.	Expressions and Equations	7-EE.3. Choose variables to represent quantities in a word problem, and construct simple equations to solve the problem by reasoning about the quantities. a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are nonnegative rational numbers and the solution is a nonnegative rational number. Fluently solve equations of these forms, e.g., by	

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	DC Math Standards		Common Core Standards	Comments
		Statistics and Probability	undoing the operations involved in producing the expression on the left. b. Solve the same word problem arithmetically and algebraically. For example, "J. has 4 packages of balloons and 5 single balloons. In all, he has 21 balloons. How many balloons are in a package?" Solve this problem arithmetically (using a sequence of operations on the given numbers), and also solve it by using a variable to stand for the number of balloons in a package, constructing an equation such as 4b + 5 = 21 to describe the situation then solving the equation. 7-SP.1. Simulate situations involving randomness using random numbers generated by a calculator or a spreadsheet or taken from a table. For example, if you guess at all ten true/false questions on a quiz, how likely are you to get at least seven answers correct? 7-SP.2. Use proportional reasoning to predict relative frequencies of outcomes for situations involving randomness, but for which a theoretical answer can be determined. For example, when rolling a number cube 600 times, one would predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. How far off might your prediction be? Use technology to generate multiple samples to approximate a distribution of sample proportions. Repeat the process for smaller sample sizes.	
Patterns,	7.PRA.7. Identify, describe, and analyze	Expressions	7-EE.3. Choose variables to represent	

7th Grade				
	DC Math Standards		Common Core Standards	Comments
Relations, and Algebra	linear relationships between two variables. Compare positive rate of change (e.g., y = 3x + 1) to negative rate of change (e.g., y = –3x + 1).	and Equations	quantities in a word problem, and construct simple equations to solve the problem by reasoning about the quantities. c. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, P + 0.05P = 1.05P means that "increase by 5%" is the same as "multiply by 1.05."	
Patterns, Relations, and Algebra	7.PRA.8. Use linear equations to model and analyze problems involving proportional relationships.	Proportions and Relationships	7-RP.3. Compute unit rates and solve proportional relationship problems in everyday contexts, such as shopping, cooking, carpentry, party planning, etc. Represent proportional relationships by equations that express how the quantities are related via the constant of proportionality or unit rate. For example, total cost, t, is proportional to the number, n, purchased at a constant price, p; this relationship can be expressed as t = pn.	
Patterns, Relations, and Algebra	7.PRA.9. Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse) and operations of rational numbers (distributive, associative, commutative); justify the process used.	Equations and Expressions	7-EE.2. Generate equivalent expressions from a given expression using the laws of arithmetic and conventions of algebraic notation. Include: a. Adding and subtracting linear expressions, as in (2x + 3) + x + (2 – x) = 2x + 5. b. Factoring, as in 4x + 4y = 4(x + y) or 5x + 7x + 10y + 14y = 12x + 24y = 12(x + 2y). c. Simplifying, as in –2(3x – 5) + 4x = 10 – 2x or x/3 + (x – 2)/4 = 7x/12 – 1/2.	
Patterns,	7.PRA.10. Use algebraic terminology			

7th Grade				
	DC Math Standards		Common Core Standards	Comments
Relations, and Algebra	including, but not limited to, variable, equation, term, coefficient, inequality, expression, and constant.			
Patterns, Relations, and Algebra	7.PRA.11. Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.	Proportions and Relationships	7-RP.4. Plot proportional relationships on a coordinate plane where each axis represents one of the two quantities involved, observe that the graph is a straight line through the origin, and find unit rates from a graph. Explain what a point (x, y) means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.	
Geometry				
Geometry	7.G.1. Identify three-dimensional figures (e.g., prisms, pyramids) by their physical appearance, distinguishing attributes, and spatial relationships such as parallel faces.		6-G.3. Understand that three-dimensional figures can be formed by joining rectangles and triangles along their edges to enclose a solid region with no gaps or overlaps. The surface area is the sum of the areas of the enclosing rectangles and triangles.	
Geometry	7.G.2. Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.		7-G.2. Understand the meaning of congruence: a plane figure is congruent to another if the second can be obtained from the first by a rigid motion.	
Geometry	7.G.3. Classify figures in terms of congruence and similarity, and apply these relationships to the solution of problems.	Geometry	7-G.2. Understand the meaning of congruence: a plane figure is congruent to another if the second can be obtained from the first by a rigid motion. 7-G.4. Understand the meaning of similarity: a plane figure is similar to another if the second can be obtained from the first by a similarity transformation (a rigid motion followed by a dilation). 7-G.5. Solve problems involving similar figures and scale drawings. Include computing actual lengths and areas from a scale drawing and reproducing a scale	

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	DC Math Standards		Common Core Standards	Comments
			drawing at a different scale.	
Geometry	7.G.4. Know and understand the Pythagorean theorem and its converse. Apply the theorem to the solution of problems, including using it to find the length of the missing side of a right triangle, and perimeter, area, and volume problems.		8-G.6. The side lengths of a right triangle are related by the Pythagorean Theorem. Conversely, if the side lengths of a triangle satisfy the Pythagorean Theorem, it is a right triangle. 8-G.7. Explain a proof of the Pythagorean Theorem and its converse. 8-G.8. Use the Pythagorean Theorem to determine unknown side lengths in right triangles and to solve problems in two and three dimensions. 8-G.9. Use the Pythagorean Theorem to find the distance between two points in a coordinate system.	
Geometry	7.G.5. Use compass, straight edge, and protractor to perform basic geometric constructions to draw polygons and circles.			
Geometry	7.G.6. Understand and use coordinate graphs to plot simple figures; determine lengths and areas related to them; and determine their image under translations, reflections, and rotations (e.g., predict how tessellations transform under translations, reflections, and rotations).	Geometry	7-G.1. Verify experimentally the fact that a rigid motion (a sequence of rotations, reflections, and translations) preserves distance and angle, e.g., by using physical models, transparencies, or dynamic geometry software: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. 8-G.1. Use coordinate grids to transform figures and to predict the effect of dilations, translations, rotations and reflections.	
Measurement				

7th Grade				
	DC Math Standards		Common Core Standards	Comments
Measurement	7.M.1. Select, convert (between systems of measurement), and use appropriate units of measurement or scale.	Geometry	5-G.1. Understand that quantities expressed in like units can be added or subtracted giving a sum or difference with the same unit; different quantities may be multiplied to obtain a new kind of quantity (e.g., as when two lengths are multiplied to compute an area, or when an area and a length are multiplied to compute a volume). 5-G.2. Understand that when measuring a quantity, if a smaller unit is used, more units must be iterated to measure the quantity in those units. 5-G.3. Convert among different-sized standard measurement units within a given measurement system (e.g., feet to yards, centimeters to meters) and use conversion in solving multi-step word problems.	
Measurement	7.M.2. Demonstrate an understanding of the concepts and apply formulas and procedures for determining measures, including those of area and perimeter/circumference of parallelograms, trapezoids, and circles. Given the formulas, determine the surface area and volume of rectangular prisms and cylinders.	Geometry	6-G.5. Solve problems involving area, volume and surface area of objects.	
Measurement	7.M.3. Demonstrate an understanding that rate is a measure of one quantity per unit value of another quantity; use models, graphs, and formulas to solve simple problems involving rates (e.g., velocity and density); check the units of the solutions; use dimensional analysis to check the reasonableness of the answer.	Proportions and Relationships	6-RP.6. Solve unit rate problems including unit pricing and constant speed, including reasoning with equations such as d = r x t, r = d/t, t = d x r.	
Measurement	7.M.4. Construct and read drawings and models made to scale.	Geometry	7-G.5. Solve problems involving similar figures and scale drawings. Include	

7th Grade				
	DC Math Standards		Common Core Standards	Comments
			computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	
Measurement	7.M.5. Use ratio and proportion, including scale factors, in the solution of problems.	Proportions and Relationships	7-RP.3. Compute unit rates and solve proportional relationship problems in everyday contexts, such as shopping, cooking, carpentry, party planning, etc. Represent proportional relationships by equations that express how the quantities are related via the constant of proportionality or unit rate. For example, total cost, t, is proportional to the number, n, purchased at a constant price, p; this relationship can be expressed as t = pn.	
Data Analysis, Statistics, and Probability				
Data Analysis, Statistics, and Probability	7.DASP.1. Find, describe, and interpret appropriate measures of central tendency (mean, median, and mode) and spread (range) that represent a set of data.	Statistics and Probability	6-SP.5. Relate the choice of the median or mean as a measure of center to the shape of the data distribution being described and the context in which it is being used. Do the same for the choice of interquartile range or mean average deviation as a measure of variation. For example, why are housing prices often summarized by reporting the median selling price, while students' assigned grades are often based on mean homework scores?	
Data Analysis, Statistics, and Probability	7.DASP.2. Select, create, interpret, and use various tabular and graphical representations of data (e.g., circle graphs, Venn diagrams, stem-and-leaf plots, histograms, tables, and charts).	Statistics and Probability	6-SP.3. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 7-SP.6. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean average	

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	DC Math Standards		Common Core Standards	Comments
			deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.	
Data Analysis, Statistics, and Probability	7.DASP.3. Describe the characteristics and limitations of a data sample. Identify different ways of selecting a sample (e.g., convenience sampling, responses to a survey, random sampling).			
Data Analysis, Statistics, and Probability	7.DASP.4. Use tree diagrams, tables, organized lists, and area models to compute probabilities for simple compound events (e.g., multiple coin tosses or rolls of dice).			
Data Analysis, Statistics, and Probability	7.DASP.5. Understand that the probability of either of two disjoint events occurring is the sum of the two individual probabilities and that the probability of one event following another, in independent trials, is the product of the two probabilities.			
		Statistics and Probability	7-SP.5. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.	
		Statistics and Probability	7-SP.7. Use measures of center and measures of variability for numerical data from uniform random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade book are generally longer than the words in a chapter of a sixth-	

7th Grade				
	DC Math Standards		Common Core Standards	Comments
			grade book.	

8th Grade				
	DC Math Standards		Common Core Standards	Comments
Number Sense				
Number Sense and Operations	8.NSO-N.1. Explain the properties of and compute with real numbers expressed in a variety of forms.	Number System	7-NS.4. Understand that there are numbers that are not rational numbers, called irrational numbers, e.g., π and $\sqrt{2}$. Together the rational and irrational numbers form the real number system. In school mathematics, the real numbers are assumed to satisfy the laws of arithmetic.	
Number Sense and Operations	8.NSO-N.2. Know that every rational number is either a terminating or repeating decimal and that every irrational number is a non-repeating decimal.	Number System	8-NS.1. Understand informally that every number on a number line has a decimal expansion, which can be found for rational numbers using long division. Rational numbers are those with repeating decimal expansions (this includes finite decimals which have an expansion that ends in a sequence of zeros).	
Number Sense and Operations	8.NSO-N.3. Know that the absolute value is the distance of the number from 0; determine the absolute value and additive inverse of real numbers; determine the absolute value of rational numbers.	Number System	7-NS.2. Understand and perform addition and subtraction with rational numbers: a. Understand that on a number line, the sum p + q is the number located a distance |q| from p, to the right of p if q is positive and to the left of p if q is negative. A number and its opposite are additive inverses (i.e., their sum is zero).	
Number Sense and Operations	8.NSO-N.4. Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10), and use them in calculations and problem situations.			
Number Sense and Operations	8.NSO-N.5. Define, compare, order, and apply frequently used irrational numbers, such as $\sqrt{2}$ and π^2 (e.g., show that if π is known to be irrational, then $3\pi^2$and $\pi/3$ also are irrational).	Number System	8-NS.2. Informally explain why$\sqrt{2}$ is irrational.	
Number Sense and Operations	8.NSO-N.6. Use the laws of exponents for integer exponents (e.g., write $2^2 \times 2^3$	Expressions and Equations	7-EE.1. Interpret numerical expressions at a level necessary to calculate their value	

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	as 2 x 2 x …and then as a single power of 2; write 2^{-3} as a fraction).		using a calculator or spreadsheet. For expressions with variables, use and interpret conventions of algebraic notation, such as y/2 is y ÷ 2 or 1/2 × y; (3 ± y)/5 is (3 ± y) ÷ 5 or 1/5 × (3 ± y); a^2 is a × a, a^3 is a × a × a, a^2b is a × a × b.	
Number Sense and Operations	8.NSO-N.7. Demonstrate an understanding of the properties of arithmetic operations on rational numbers.	Number System	7-NS.2. Understand and perform addition and subtraction with rational numbers 7-NS.3. Understand and perform multiplication and division with rational numbers	
Computation and Operations				
Number Sense and Operations	8.NSO-C.8. Calculate weighted averages such as course grades, consumer price indexes, and sports ratings.			
Number Sense and Operations	8.NSO-C.9. Solve problems involving ratio units such as miles per hour, dollars per pound, or persons per square mile.	Proportions and Relationships	7-RP.1. Form ratios of nonnegative rational numbers and compute corresponding unit rates. For example, a person might walk ½ mile in each ¼ hour; the unit rate for this ratio is (1/2)/(1/4) miles per hour, equivalently 2 miles per hour. Include ratios of lengths, areas and other quantities, including when quantities being compared are measured in different units.	
Number Sense and Operations	8.NSO-C.10. Solve problems involving derived quantities such as density, velocity, and weighted averages.			
Number Sense and Operations	8.NSO-C.11. Solve problems that involve markups, commissions, profits, and simple and compound interest.			
Number Sense and Operations	8.NSO-C.12. Apply the rules of powers and roots to the solution of problems.	Expressions and Equations	6-EE.1. Understand that an expression records operations with numbers or with letters standing for numbers. For example, the expression 2 x (8 + 7) records adding 8 and 7 then multiplying by 2; the expression 5 – y records subtracting y from 5. Focus on the operations of addition, subtraction, multiplication and division, with some attention to square or cube roots.	

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Number Sense and Operations	8.NSO-C.13. Use the inverse relationship between squaring and finding the square root of a perfect square integer to solve problems.			
Number Sense and Operations	8.NSO-C.14. Multiply and divide numbers written in scientific notation.			
Number Sense and Operations	8.NSO-C.15. Select and use appropriate operations — addition, subtraction, multiplication, division, and positive integer exponents — to solve problems with rational numbers, including negative rationals.	Number System	7-NS.2. Understand and perform addition and subtraction with rational numbers 7-NS.3. Understand and perform multiplication and division with rational numbers	
Estimation				
Number Sense and Operations	8.NSO-E.16. Estimate and solve problems with square roots; find square roots of perfect squares and approximate the square roots of non-perfect squares by locating them between consecutive integers.	Number System	8-NS.3. Use rational approximations (including those obtained from truncating decimal expansions) to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions (e.g., π^2). For example, show that the square root of 2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	
Number Sense and Operations	8.NSO-E.17. Determine estimates to a certain stated accuracy.			
Patterns, Relations, and Algebra				
Patterns, Relations, and Algebra	8.PRA.1. Use tables and graphs to represent and compare linear growth patterns. In particular, compare rates of change and x- and y-intercepts of different linear patterns.	Expressions and Equations	8-EE.8. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. 8-F.1. Understand that a function from one set (called the domain) to another set (called the range) is a rule that assigns to each element of the domain (an input) exactly one element of the range (the corresponding output). The graph of a function is the set of ordered pairs consisting of an input and the	

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			corresponding output. Function notation is not required in Grade 8.	
Patterns, Relations, and Algebra	8.PRA.2. Set up and solve linear equations and inequalities with one or two variables using algebraic methods and graphs.		8-EE.2. Solve linear equations with rational number coefficients, including equations that require expanding expressions using the distributive law and collecting like terms. 8-EE.5. Understand that the graph of a linear equation in two variables is a line, the set of pairs of numbers satisfying the equation. If the equation is in the form y = mx + b, the graph can be obtained by shifting the graph of y =mx by b units (upwards if b is positive, downwards if b is negative). The slope of the line is m. 8-F.2. Evaluate expressions that define functions, and solve equations to find the input(s) that correspond to a given output.	
Patterns, Relations, and Algebra	8.PRA.3. Use linear equations to model and analyze problems involving proportional relationships.	Expressions and Equations	8-EE.7. Graph proportional relationships and relationships defined by a linear equation; find the slope and interpret the slope in context.	
Patterns, Relations, and Algebra	8.PRA.4. Identify the slope of a line as a measure of its steepness and as a constant rate of change from its table of values, equation, or graph. Apply the concept of slope to the solution of problems.	Expressions and Equations	8-EE.3. Understand that the slope of a non-vertical line in the coordinate plane has the same value for any two distinct points used to compute it. This can be seen using similar triangles. 8-SP.4. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	
Patterns, Relations, and Algebra	8.PRA.5. Identify the roles of variables within an equation (e.g., y = mx + b, expressing y as a function of x with			

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	parameters m and b).			
Patterns, Relations, and Algebra	8.PRA.6. Distinguish between numerical and algebraic expressions, equations, and inequalities.	Expressions and Equations	8-EE.6. Understand that a proportional relationship between two variable quantities y and x can be represented by the equation y = mx. The constant m is the unit rate, and tells how much of y per unit of x.	
Patterns, Relations, and Algebra	8.PRA.7. Interpret the formula (–x)(–y) = xy in calculations involving such things as distance, speed, and time, or in the graphing of linear functions. Use this identity to simplify algebraic expressions [e.g., (–2)(–x+2) = 2x – 4)].	Expressions and Equations	8.EE-2. Solve linear equations with rational number coefficients, including equations that require expanding expressions using the distributive law and collecting like terms.	
Patterns, Relations, and Algebra	8.PRA.8. Explain and analyze - both quantitatively and qualitatively, using pictures, graphs, charts, and equations — how a change in one variable results in a change in another variable in functional relationships (e.g., C = πd, A = πr2 (A as a function of r), $A_{rectangle}$ = lw ($A_{rectangle}$ as a function of l and w).	Statistics and Probability	8-SP.3. Understand that a straight line is a widely used model for exploring relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	
Patterns, Relations, and Algebra	8.PRA.9. Graph a linear equation using ordered pairs; identify and represent the graphs of linear functions.	Expressions and Equations	8-EE.9. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. 8-EE.10. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because the quantity 3x + 2y cannot simultaneously be 5 and 6. 8-EE.11. Solve and explain word problems leading to two linear equations in two variables.	

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			8-EE.12. Solve problems involving lines and their equations. For example, decide whether a point with given coordinates lies on the line with a given equation; construct an equation for a line given two points on the line or one point and the slope; given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.	
Geometry				
Geometry	8.G.1. Analyze, apply, and explain the relationship between the number of sides and the sums of the interior and exterior angle measures of polygons.		7-G.8. Justify facts about the angle sum of triangles, exterior angles, and alternate interior angles created when parallel lines are cut by a transversal, e.g., by using physical models, transparencies, or dynamic geometry software to make rigid motions and give informal arguments. For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so.	
Geometry	8.G.2. Demonstrate an understanding of the relationships of angles formed by intersecting lines, including parallel lines cut by a transversal.		7-G.9. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	
Geometry	8.G.3. Demonstrate an understanding of conditions that indicate two triangles are similar: the corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity).	Geometry	8-G.2. Explain using rigid motions the meaning of congruence for triangles as the equality of all pair of sides and all pairs of angles. 8-G.3. Give an informal explanation using rigid motions of the SAS and ASA criteria for triangle congruence, and use them to prove simple theorems. 8-G.4. Explain using similarity transformations the meaning of similarity for triangles as the equality of all pairs of angles and the proportionality of all pairs	

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	DC Math Standards		Common Core Standards	Comments
			of sides. 8-G.5. Give an informal explanation using similarity transformations of the AA and SAS criteria for triangle similarity, and use them to prove simple theorems.	
Geometry	8.G.4. Use a straightedge, compass, protractor, or other tool to formulate and test conjectures and to draw geometric figures (Example: Draw the perpendicular bisector of a segment, an equilateral triangle, the bisector of an angle, diagonals, midpoints, radii, diameters, and chords of circles).	Geometry	8-G.6. The side lengths of a right triangle are related by the Pythagorean Theorem. Conversely, if the side lengths of a triangle satisfy the Pythagorean Theorem, it is a right triangle. 8-G.7. Explain a proof of the Pythagorean Theorem and its converse. 8-G.8. Use the Pythagorean Theorem to determine unknown side lengths in right triangles and to solve problems in two and three dimensions. 8-G.9. Use the Pythagorean Theorem to find the distance between two points in a coordinate system. 8-G.10. Draw (freehand, with ruler and protractor, and with technology) geometric shapes from given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the triangle is uniquely defined, ambiguously defined or nonexistent.	
Geometry	8.G.5. Apply spatial reasoning by recognizing and drawing two-dimensional representations of three-dimensional objects (e.g., nets, projections, and perspective drawings of cylinders, prisms, and cones).	Geometry	8-G.11. Understand that slicing a three-dimensional figure with a plane produces a two-dimensional figure. Describe plane sections of right rectangular prisms and right rectangular pyramids.	
Geometry	8.G.6. Find the distance between two points on the coordinate plane using the distance formula; find the midpoint of the line segment; recognize that the distance formula is an application of the Pythagorean theorem.			

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	DC Math Standards		Common Core Standards	Comments
Measurement				
Measurement	8.M.1. Given the formulas, convert from one system of measurement to another.	Measurement and Data	5-MD.3. Convert among different-sized standard measurement units within a given measurement system (e.g., feet to yards, centimeters to meters) and use conversion in solving multi-step word problems.	
Measurement	8.M.2. Understand the concept of surface area and volume; given the formulas, determine the surface area and volume of rectangular prisms, cylinders, and spheres.	Geometry	6-G.4. Find the surface area of cubes, prisms and pyramids (include the use of nets to represent these figures).	
Measurement	8.M.3. Use a straightedge, compass, protractor, or other tools to formulate and test conjectures and to draw geometric figures.			
Measurement	8.M.4. Solve problems about similar figures and scale drawings. Understand that when the lengths of all dimensions of an object are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.	Geometry	6-G.7. Use exponents and symbols for square roots and cube roots to express the area of a square and volume of a cube in terms of their side lengths, and to express their side lengths in terms of their area or volume.	
Measurement	8.M.5. Understand and use the fact that when two polygons or circles are similar with scale factor of r, their areas are related by a factor of r^2.			
Measurement	8.M.6. Use proportions to express relationships between corresponding parts of similar figures.			
Data Analysis, Statistics, and Probability				
Data Analysis, Statistics, and Probability	8.DASP.1. Revisit measures of central tendency (mean, median, and mode) and spread (range) that represent a set of data and then observe the change in each when an "outlier" is adjoined to the data set or removed from it. Use these notions to compare different sets of data and explain how each can be useful	Statistics and Probability	6-SP.5. Relate the choice of the median or mean as a measure of center to the shape of the data distribution being described and the context in which it is being used. Do the same for the choice of interquartile range or mean average deviation as a measure of variation. For example, why are housing prices often summarized by	

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	in a different way to summarize social phenomena such as price levels, clothing sizes, and athletic performances.		reporting the median selling price, while students' assigned grades are often based on mean homework scores?	
Data Analysis, Statistics, and Probability	8.DASP.2. Select, create, interpret, and use various tabular and graphical representations of data (e.g., scatter plots, box-and-whisker plots).	Statistics and Probability	8-SP.1. Understand that scatter plots for bivariate measurement data may reveal patterns of association between two quantities. 8-SP.2. Construct and interpret scatter plots for bivariate measurement data. Describe patterns such as clustering, outliers, positive or negative association, linear association, nonlinear association. 8-SP.5. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	
Data Analysis, Statistics, and Probability	8.DASP.3. Recognize practices of collecting and displaying data that may bias the presentation or analysis.			
Data Analysis, Statistics, and Probability	8.DASP.4. Use data to estimate the probability of future events (e.g., batting averages).			
Data Analysis, Statistics, and Probability	8.DASP.5. Select, create, interpret, and use various tabular and graphical representations of data; differentiate between continuous and discrete data and ways to represent them.			

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Data Analysis, Statistics, and Probability	8.DASP.6. Apply the Fundamental Counting Principle (basic combinatorics) to find total number of outcomes possible for independent and dependent events, and calculate the probabilities using organized lists or tree diagrams.			
Data Analysis, Statistics, and Probability	8.DASP.7. Understand the difference between independent and dependent events, and recognize common misconceptions involving probability (e.g., Alice rolls a 6 on a die three times in a row; she is just as likely to roll a 6 on the fourth roll as she was on any previous roll).			
		Expressions and Equations	8-EE.1. Understand that a linear equation in one variable might have one solution, infinitely many solutions, or no solutions. Which of these possibilities is the case can be determined by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).	
		Functions	8-F.3. Compare properties of two functions represented in different ways (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.	
		Functions	8-F.4. Understand that a function is linear if it can be expressed in the form y = mx + b or if its graph is a straight line. For example, the function y = x2 is not a linear function because its graph contains the points (1,1), (–1,1) and (0,0), which are not on a straight line.	

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		Functions	8-F.5. Understand that functions can describe situations where one quantity determines another.	

High School				
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High School - Algebra				
Number Sense				
	AI.N.1. Use the properties of operations on real numbers, including the associative, commutative, identity, and distributive properties, and use them to simplify calculations.		7-NS.4. Understand that there are numbers that are not rational numbers, called irrational numbers, e.g., π and $\sqrt{2}$. Together the rational and irrational numbers form the real number system. In school mathematics, the real numbers are assumed to satisfy the laws of arithmetic. A-APR.8. Transform simple rational expressions using the commutative, associative, and distributive laws, and the inverse relationship between multiplication and division.	
	AI.N.2. Simplify numerical expressions, including those involving integer exponents or the absolute value, e.g., $3(24 – 1) = 45$, $4\|3 –5\| + 6 = 14$; apply such simplifications in the solution of problems.		7-EE.2. Generate equivalent expressions from a given expression using the laws of arithmetic and conventions of algebraic notation. Include: a. Adding and subtracting linear expressions, as in $(2x + 3) + x + (2 – x) = 2x + 5$. b. Factoring, as in $4x + 4y = 4(x + y)$ or $5x + 7x + 10y + 14y = 12x + 24y = 12(x + 2y)$. c. Simplifying, as in $–2(3x – 5) + 4x = 10 – 2x$ or $x/3 + (x – 2)/4 = 7x/12 – 1/2$.	
	AI.N.3. Calculate and apply ratios, proportions, rates, and percentages to solve a range of consumer and practical problems.		7-RP.3. Compute unit rates and solve proportional relationship problems in everyday contexts, such as shopping, cooking, carpentry, party planning, etc. Represent proportional relationships by equations that express how the quantities are related via the constant of proportionality or unit rate. For example, total cost, t, is proportional to the number, n, purchased at a constant price, p; this relationship can be expressed as $t = pn$.	

High School				
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			7-RP.8. Solve multi-step percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error, expressing monthly rent as a percentage of take-home pay.	
	AI.N.4. Use estimation to judge the reasonableness of results of computations and of solutions to problems involving real numbers, including approximate error in measurement and the approximate value of square roots. (Reminder: This is without the use of calculators.)			
	AI.N.5. Understand the concept of nth roots of positive real numbers and of raising a positive real number to a fractional power. Use the rules of exponents also for fractional exponents.		A-SSE.6. Rewrite expressions using the laws of exponents. For example, (x1/2)3 = x3/2 and 1/x = x–1. N-RN.2. Understand that the definition of the meaning of zero, positive rational, and negative exponents follows from extending the laws of exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, since (51/3)3 = 5(1/3)·3 = 51 = 5, 51/3 is a cube root of 5. N-RN.5. Rewrite expressions using the laws of exponents. For example, (51/2)3 = 53/2 and 1/5 = 5–1.	
	AI.N.6. Apply the set operations of union and intersection and the concept of complement, universal set, and disjoint sets, and use them to solve problems, including those involving Venn diagrams.		S-CP.1. Understand that events are subsets of a sample space; often, events of interest are defined by using characteristics (or categories) of the sample points, or as unions, intersections, or complements thereof (and, or, not). A sample point may belong to several events (categories). S-CP.4. Compute probabilities by constructing and analyzing sample spaces, representing them by tree diagrams,	

High School				
	DC Math Standards		Common Core Standards	Comments
			systematic lists, and Venn diagrams. S-CP.6. Apply concepts such as intersections, unions and complements of events, and conditional probability and independence to define or analyze events, calculate probabilities and solve problems.	
Patterns, Relations, and Algebra				
	AI.P.1. Recognize, describe, and extend patterns governed by a linear, quadratic, or exponential functional relationship or by a simple iterative process (e.g., the Fibonacci sequence).		A-APR.5. STEM Understand that rational expressions are quotients of polynomials. They form a system analogous to the rational numbers, closed under division by a nonzero rational function. A-APR.6. Add, subtract and multiply polynomials. A-APR.7. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the polynomial.	
	AI.P.2. Use properties of the real number system to judge the validity of equations and inequalities and to justify every step in a sequential argument.			
	AI.P.3. Demonstrate an understanding of relations and functions. Identify the domain, range, and dependent and independent variables of functions.		F-IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. F-IF.8. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function	
	AI.P.4. Translate between different		F-IF.5. Describe qualitatively the functional	

High School				
	DC Math Standards		Common Core Standards	Comments
	representations of functions and relations: graphs, equations, sets of ordered pairs (scatter plots), verbal, and tabular.		relationship between two quantities by reading a graph (e.g., where the function is increasing or decreasing, what its long-run behavior appears to be, and whether it appears to be periodic). F-IF.6. Sketch a graph that exhibits the qualitative features of a function that models a relationship between two quantities. F-IF.7. Compare properties of two functions represented in different ways (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, draw conclusions about the graph of a quadratic function from its algebraic expression.	
	AI.P.5. Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x and y-intercepts from its graph or from a linear equation that represents the line.		F-IF.9. Describe the qualitative behavior of functions presented in graphs and tables. Identify: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. 8-EE.4. Understand that two lines with well-defined slopes are parallel if and only if their slopes are equal. 8-EE.5. Understand that the graph of a linear equation in two variables is a line, the set of pairs of numbers satisfying the equation. If the equation is in the form y = mx + b, the graph can be obtained by shifting the graph of y =mx by b units (upwards if b is positive, downwards if b is negative). The slope of the line is m. 8-EE.6. Understand that a proportional relationship between two variable quantities y and x can be represented by the equation y = mx. The constant m is the unit rate, and tells how much of y per unit	

High School				
	DC Math Standards		Common Core Standards	Comments
			of x. 8-EE.7. Graph proportional relationships and relationships defined by a linear equation; find the slope and interpret the slope in context. 8-EE.8. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	
	AI.P.6. Find a linear function describing a line from a graph or a geometric description of the line (e.g., by using the point-slope or slope y-intercept formulas). Explain the significance of a positive, negative, zero, or undefined slope.		8-EE.12. Solve problems involving lines and their equations. For example, decide whether a point with given coordinates lies on the line with a given equation; construct an equation for a line given two points on the line or one point and the slope; given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. 8-F.6. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship; from two (x, y) values, including reading these from a table; or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. 8-F.7. Describe qualitatively the functional relationship between two quantities by reading a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. 8-SP.4. Use the equation of a linear model	

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	DC Math Standards		Common Core Standards	Comments
			to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	
	AI.P.7. Find linear functions that represent lines either perpendicular or parallel to a given line and through a point (e.g., by using the point-slope form of the equation).		8-G.12. Use hands-on activities to demonstrate and describe properties of: parallel lines in space, the line perpendicular to a given line through a given point, lines perpendicular to a given plane, lines parallel to a given plane, the plane or planes passing through three given points, and the plane perpendicular to a given line at a given point. G-GPE.1. Understand that two lines with well-defined slopes are perpendicular if and only if the product of their slopes is equal to –1. G-GPE.7. Use the slope criteria for parallel and perpendicular lines to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	
	AI.P.8. Add, subtract, and multiply polynomials with emphasis on 1st- and 2nd-degree polynomials.		A-APR.6. Add, subtract and multiply polynomials.	
	AI.P.9. Demonstrate facility in symbolic manipulation of polynomial and rational expressions by rearranging and collecting terms, factoring (e.g., $a^2 – b^2 = (a + b)(a – b)$, $x^2 + 10x + 21 = (x + 3)(x + 7)$, $5x^4 + 10x^3 – 5x^2 = 5x^2 (x^2 + 2x – 1)$), identifying and canceling common factors in rational expressions, and applying the properties of positive integer exponents.		A-APR.2. Understand that polynomial identities become true statements no matter which real numbers are substituted. For example, the polynomial identity (x2 + y2)2 = (x2 – y2)2 + (2xy)2 can be used to generate Pythagorean triples.	
	AI.P.10. Divide polynomials by monomials with emphasis on 1st- and		A-APR.9. Divide a polynomial p(x) by a divisor of the form x – a using long division.	

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	2nd-degree polynomials.			
	AI.P.11. Perform basic arithmetic operations with rational expressions and functions.		A-APR.6. Add, subtract and multiply polynomials. A-APR.9. Divide a polynomial p(x) by a divisor of the form x – a using long division.	
	AI.P.12. Find solutions to quadratic equations (with real roots) by factoring, completing the square, or using the quadratic formula. Demonstrate an understanding of the equivalence of the methods.		F-BF.6. Solve problems involving linear, quadratic, and exponential functions A-REI.2. Understand that the method of completing the square can transform any quadratic equation in x into an equivalent equation of the form (x – p)2 = q. This leads to the quadratic formula. A-REI.12. Solve quadratic equations in one variable. Include methods such as inspection (e.g. for x2 = 49), square roots, completing the square, the quadratic formula and factoring. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.	
	AI.P.13. Solve equations and inequalities, including those involving absolute value of linear expressions (e.g., |x – 2| > 5), and apply to the solution of problems.			
	AI.P.14. Solve everyday problems (e.g., compound interest and direct and inverse variation problems) that can be modeled using linear or quadratic functions. Apply appropriate graphical or symbolic methods to the solution.		A-REI.8. Understand that equations and inequalities can be viewed as constraints in a problem situation, e.g., inequalities describing nutritional and cost constraints on combinations of different foods 8-EE.10. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because the quantity 3x + 2y cannot simultaneously be 5 and 6. 8-EE.11. Solve and explain word problems leading to two linear equations in two	

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	DC Math Standards		Common Core Standards	Comments
			variables.	
	AI.P.15. Solve everyday problems (e.g., mixture, rate, and work problems) that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution.			
Data Analysis, Statistics, and Probability				
	AI.D.1. Select, create, and interpret an appropriate graphical representation (e.g., scatter plot, table, stem-and-leaf plots, circle graph, line graph, and line plot) for a set of data, and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data.		8-SP.2. Construct and interpret scatter plots for bivariate measurement data. Describe patterns such as clustering, outliers, positive or negative association, linear association, nonlinear association. S-SI.5. Compare data on two or more count or measurement variables by using plots on the real number line (dot plots, histograms, and box plots). Use statistics appropriate to the shape of the data distribution to summarize center (median, mean) and spread (interquartile range, standard deviation) of the data sets. Interpret changes in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	
High School - Geometry				
	G.G.1. Know correct geometric notation, including the notation for line segment (AB) and angle (<ABC).		G-CO.6. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; two lines parallel to a third are parallel to each other; points on a perpendicular bisector of a segment are exactly those equidistant from the segment's endpoints.	
	G.G.2. Recognize special types of polygons (e.g., isosceles triangles, parallelograms, and rhombuses).		G-CO.8. Use and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid and kite.	

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	G.G.3. Apply properties of sides, diagonals, and angles in special polygons; identify their parts and special segments (e.g., altitudes, mid-segments); determine interior angles for regular polygons.		G-CO.7. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°, base angles of isosceles triangles are congruent, the triangle inequality, the longest side of a triangle faces the angle with the greatest measure and vice-versa, the exterior-angle inequality, and the segment joining midpoints of two sides of a triangle parallel to the third side and half the length. G-CO.9. Characterize parallelograms in terms of equality of opposite sides, in terms of equality of opposite angles, and in terms of bisection of diagonals; characterize rectangles as parallelograms with equal diagonals. G-SRT.3. Understand that the assumed properties of dilations can be used to establish the AA, SAS, and SSS criteria for similarity of triangles.	
	G.G.4. Draw and label sets of points such as line segments, rays, and circles.			
	G.G.5. Detect symmetries of geometric figures.		G-SRT.5. Understand that a line parallel to one side of a triangle divides the other two proportionally, and conversely. G-C.3. Identify and define radius, diameter, chord, tangent, secant, and circumference.	
	G.G.6. Apply the triangle inequality and other inequalities associated with triangles (e.g., the longest side is opposite the greatest angle) to prove theorems and to solve problems.		G-SRT.7. Use and explain the relationship between the sine and cosine of complementary angles.	
	G.G.7. Use properties and theorems about congruent and similar figures and about perpendicular and parallel lines to solve problems.		G-CO.2. Understand that criteria for triangle congruence are ways to specify enough measures in a triangle to ensure that all triangles drawn with those measures are congruent. G-CO.3. Understand that criteria for triangle congruence (ASA, SAS, and SSS) can	

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			be established using rigid motions. G-GPE.7. Use the slope criteria for parallel and perpendicular lines to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	
	G.G.8. Write simple proofs of theorems in geometric situations, such as theorems about triangles, congruent and similar figures, and perpendicular and parallel lines (e.g., the longest side is opposite the greatest angle, two lines parallel to a third are parallel to each other; perpendicular bisectors of line segments are the set of all points equidistant from the two end points).		G-CO.4. Understand that geometric diagrams can be used to test conjectures and identify logical errors in fallacious proofs. G-CO.6. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; two lines parallel to a third are parallel to each other; points on a perpendicular bisector of a segment are exactly those equidistant from the segment's endpoints. G-CO.7. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°, base angles of isosceles triangles are congruent, the triangle inequality, the longest side of a triangle faces the angle with the greatest measure and vice-versa, the exterior-angle inequality, and the segment joining midpoints of two sides of a triangle parallel to the third side and half the length. G-CO.8. Use and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid and kite. G-SRT.6. Use triangle similarity criteria to solve problems and to prove relationships in geometric figures. Include a proof of the Pythagorean theorem using triangle similarity.	

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			G-C.7. STEM Prove and use theorems about circles, and use these theorems to solve problems involving 8-G.7. Explain a proof of the Pythagorean Theorem and its converse.	
	G.G.9. Distinguish between postulates and theorems. Use inductive and deductive reasoning, as well as proof by contradiction. Given a conditional statement, write its inverse, converse, and contra-positive.			
	G.G.10. Apply formulas for a rectangular coordinate system to justify theorems.			
	G.G.11. Draw congruent and similar figures using a compass, straightedge, or protractor. Justify the constructions by logical argument.		G-CO.10. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. G-CO11. Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle. G-C.6. STEM Construct a tangent line from a point outside a given circle to the circle.	
	G.G.12. Apply congruence and similarity correspondences (e.g., ΔABC ≅ ΔXYZ) and properties of the figures to find missing parts of geometric figures, and provide logical justification.		G-SRT.6. Use triangle similarity criteria to solve problems and to prove relationships in geometric figures. Include a proof of the Pythagorean theorem using triangle similarity.	
	G.G.13. Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.		G-C.3. Identify and define radius, diameter, chord, tangent, secant, and circumference. G-C.5. Determine the arc lengths and the areas of sectors of circles, using	

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			proportions. G-C.7. STEM Prove and use theorems about circles, and use these theorems to solve problems involving e. Properties of chords, tangents, and secants as an application of triangle similarity G-SRT.2. Understand that the dilation of a given segment is parallel to the given segment and longer or shorter in the ratio given by the scale factor. A dilation leaves a segment unchanged if and only if the scale factor is 1 G-SRT.5. Understand that a line parallel to one side of a triangle divides the other two proportionally, and conversely	
	G.G.14. Solve simple triangle problems using the triangle angle sum property and/or the Pythagorean theorem; study and understand more than one proof of this theorem.		G-SRT.6. Use triangle similarity criteria to solve problems and to prove relationships in geometric figures. Include a proof of the Pythagorean theorem using triangle similarity. G-SRT.8. Use sine, cosine, tangent, and the Pythagorean Theorem to solve right triangles2 in applied problems G-TGT.4. STEM Understand that the Laws of Sines and Cosines embody the triangle congruence criteria, in that three pieces of information are usually sufficient to completely solve a triangle. Furthermore, these laws yield two possible solutions in the ambiguous case, illustrating that “Side-Side-Angle” is not a congruence criterion.	
	G.G.15. Use the properties of special triangles (e.g., isosceles, equilateral, 30-60°-90°, 45°-45°-90°) to solve problems.			
	G.G.16. Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems.			
	G.G.17. Demonstrate an understanding		F-IF.9. Describe the qualitative behavior of	

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	of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line (e.g., by using the point-slope or slope y-intercept formulas). Explain the significance of a positive, negative, zero, or undefined slope.		functions presented in graphs and tables. Identify: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetries; end behavior; and periodicity S-SI.8. Use a model function fitted to the data to solve problems in the context of the data, interpreting the slope (rate of change) and the intercept (constant term). 8-EE.4. Understand that two lines with well-defined slopes are parallel if and only if their slopes are equal. 8-EE.5. Understand that the graph of a linear equation in two variables is a line, the set of pairs of numbers satisfying the equation. If the equation is in the form y = mx + b, the graph can be obtained by shifting the graph of y =mx by b units (upwards if b is positive, downwards if b is negative). The slope of the line is m. 8-EE.6. Understand that a proportional relationship between two variable quantities y and x can be represented by the equation y = mx. The constant m is the unit rate, and tells how much of y per unit of x. 8-EE.7. Graph proportional relationships and relationships defined by a linear equation; find the slope and interpret the slope in context. 8-EE.8. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. 8-F.6. Construct a function to model a	

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			linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship; from two (x, y) values, including reading these from a table; or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. 8-F.7. Describe qualitatively the functional relationship between two quantities by reading a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. 8-SP.4. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	
	G.G.18. Using rectangular coordinates, calculate midpoints of segments, slopes of lines and segments, and distances between two points, and apply the results to the solutions of problems.		N-CN.5. STEM Understand that on the complex plane, as on the real line, the distance between numbers is the absolute value of the difference, and the midpoint of a segment is the average of the numbers at its endpoints.	
	G.G.19. Find linear equations that represent lines either perpendicular or parallel to a given line and through a point (e.g., by using the point-slope form of the equation).		G-GPE.1. Understand that two lines with well-defined slopes are perpendicular if and only if the product of their slopes is equal to –1. G-GPE.7. Use the slope criteria for parallel and perpendicular lines to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	

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	G.G.20. Draw the results and interpret transformations on figures in the coordinate plane such as translations, reflections, rotations, scale factors, and the results of successive transformations. Apply transformations to the solution of problems.		G-CO.12. Use two-dimensional representations to transform figures and to predict the effect of translations, rotations, and reflections. G-CO.13. Use two-dimensional representations to transform figures and to predict the effect of dilations.	
	G.G.21. Demonstrate the ability to visualize solid objects and recognize their projections, cross sections, and graph points in 3-D.		8-G.11. Understand that slicing a three-dimensional figure with a plane produces a two-dimensional figure. Describe plane sections of right rectangular prisms and right rectangular pyramids. 6-G.3. Understand that three-dimensional figures can be formed by joining rectangles and triangles along their edges to enclose a solid region with no gaps or overlaps. The surface area is the sum of the areas of the enclosing rectangles and triangles.	
	G.G.22. Find and use measures of perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles.		7-G.7. Know the formulas relating the area, radius and circumference of a circle and solve problems requiring the use of these formulas; give an informal derivation of the relationship between the circumference and area of a circle. 6-G.2. Find the areas enclosed by right triangles, other triangles, special quadrilaterals, and polygons (by composing into rectangles or decomposing into triangles and other shapes).	
	G.G.23. Find and use measures of lateral areas, surface areas, and volumes of prisms, pyramids, spheres, cylinders, and cones, and relate these measures to each other using formulas (e.g., find the volume of a sphere with a specified surface area).		6-G.5. Solve problems involving area, volume and surface area of objects.	
	G.G.24. Relate changes in the measurement (including units) of one attribute of an object to changes in other		7-G.5. Solve problems involving similar figures and scale drawings. Include computing actual lengths and areas from a	

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	attributes (e.g., how changing the radius or height of a cylinder affects its surface area or volume).		scale drawing and reproducing a scale drawing at a different scale. 7-G.6. Use informal arguments involving approximation by lines, squares, and cubes to see that a similarity transformation with a scale factor of k leaves angle measures unchanged, changes lengths by a factor of k, changes areas by a factor of k^2, and changes volumes by a factor of k^3.	
	G.G.25. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements.			
	G.G.26. Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.		6-RP.5. Understand that for a ratio a:b, the corresponding unit rate is a/b. If there are a units of the first quantity for every b units of the second, where b ≠ 0, then there are a/b units of the first quantity for 1 unit of the second. For example, if a recipe has a ratio of 3 cups of flour to 4 cups of sugar, then there is 3/4 cup of flour for each cup of sugar. 6-RP.6. Solve unit rate problems including unit pricing and constant speed, including reasoning with equations such as d = r x t, r = d/t, t = d x r. N-Q.5. Use and interpret quantities and units correctly in algebraic formulas	
High School – Algebra II				
Number Sense				
	AII.N.1. Know and use the properties of operations on real numbers, including the existence of the identity and inverse elements for addition and multiplication and the existence of nth roots of positive real numbers for any positive integer n, and the nth power of positive real numbers.			
	AII.N.2. Simplify numerical expressions		N-RN.2. Understand that the definition of	

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	with powers and roots, including fractional and negative exponents.		the meaning of zero, positive rational, and negative exponents follows from extending the laws of exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, since (51/3)3 = 5(1/3)·3 = 51 = 5, 51/3 is a cube root of 5.	
	AII.N.3. Know the representation of complex numbers (e.g., a + bi where a and b are real numbers) and the procedures for adding, multiplying, and inverting complex numbers. Understand the associative, commutative, and identity properties for complex arithmetic.		N-CN.1. Understand that the relation $i^2 = -1$ and the commutative, associative, and distributive laws can be used to calculate with complex numbers. N-CN.2. STEM Understand that polynomials can be factored over the complex numbers, e.g., as in $x^2 + 4 = (x + 2i)(x - 2i)$. N-CN.6. Add, subtract, and multiply complex numbers	
Patterns, Relations, and Algebra				
	AII.P.1. Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative and recursive patterns such as Fibonacci Numbers and Pascal's Triangle.			
	AII.P.2. Identify arithmetic and geometric sequences and finite arithmetic and geometric series. Use the properties of such sequences and series to solve problems, including finding the formula for the general term and the sum, recursively and explicitly.		F-BF.1. Understand that functions can be described by specifying an explicit expression, a recursive process or steps for calculation.	
	AII.P.3. Understand functional notation, evaluate a function at a specified point in its domain, and perform operations on functions with emphasis on the domain and range.		F-IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x F-IF.3. Understand that a function defined by an expression may be written in different but equivalent forms, which can	

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			reveal different properties of the function. F-IF.4. Use function notation and evaluate functions for inputs in their domains	
	AII.P.4. Understand exponential and logarithmic functions and their basic arithmetic properties, including change of base and formulas for exponential of a sum and logarithm of a product.		F-LQE.1. Understand that a linear function, defined by f(x) = mx + b for some constants m and b, models a situation in which a quantity changes at a constant rate, m, relative to another F-LQE.2. Understand that quadratic functions have maximum or minimum values and can be used to model problems with optimum solutions F-LQE.3. Understand that an exponential function, defined by f(x) = abx or by f(x) = a(1 + r)x for some constants a, b > 0 and r > –1, models a situation where a quantity grows or decays by a constant factor or a constant percentage change over each unit interval A-REI.19. In the context of exponential models, solve equations of the form a bct = d where a, c, and d are specific numbers and the base b is 2, 10, or e	
	AII.P.5. Given algebraic, numeric, and/or graphical representations, recognize functions as polynomial, rational, logarithmic, or exponential, and describe their behavior.		A-REI.20. STEM Relate the properties of logarithms to the laws of exponents and solve equations involving exponential functions F-IF.10. Use technology to exhibit the effects of parameter changes on the graphs of linear, power, quadratic, square root, cube root, and polynomial functions, and simple rational, exponential, logarithmic, sine, cosine, absolute value, and step functions F-BF.6. Solve problems involving linear, quadratic, and exponential functions F-LQE.8. Understand that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically,	

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			or (more generally) as a polynomial function F-LQE.15. Recognize a quantitative relationship as linear, exponential, or neither from description of a situation. F-LQE.16. Compare quantities increasing exponentially to quantities increasing linearly or as a polynomial function	
	AII.P.6. Find solutions to radical equations; find solutions to quadratic equations (with real coefficients and real or complex roots) graphically, by factoring, by completing the square, or by using the quadratic formula.			
	AII.P.7. Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods, including the quadratic formula. Include polynomial, exponential, and logarithmic functions, expressions involving the absolute values, and simple rational expressions.		F-BF.6. Solve problems involving linear, quadratic, and exponential functions A-REI.19. In the context of exponential models, solve equations of the form a bct = d where a, c, and d are specific numbers and the base b is 2, 10, or e	
	AII.P.8. Explore matrices and their operations, including using them to solve systems of linear equations. Apply to solutions of everyday problems.		N-VM.6. STEM Understand that matrices can be multiplied by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. Matrices of the same dimensions can be added or subtracted. Matrices with compatible dimensions can be multiplied. Unlike multiplication of numbers, matrix multiplication is not a commutative operation, but still satisfies the associative and distributive laws N-VM.13. STEM Add, subtract, and multiply matrices of appropriate dimensions. N-VM.14. STEM Use matrices to store and manipulate data, e.g., to represent payoffs or incidence relationships in a network. N-VM.15. STEM Represent systems of linear equations as matrix equations.	

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	AII.P.9. Use symbolic, numeric, and graphical methods to solve systems of equations and/or inequalities involving algebraic, exponential, and logarithmic expressions. Describe the relationships among the methods.		A-REI.15. Solve systems of linear equations algebraically and graphically, focusing on pairs of linear equations in two variables F-BF.10. STEM Evaluate composite functions and compose functions symbolically F-BF.13. STEM Verify symbolically by composition that one function is the inverse of another F-IF.8. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function	
	AII.P.10. Solve everyday problems that can be modeled using polynomial, rational, exponential, logarithmic, and step functions; absolute values; and square roots. Apply appropriate graphical, tabular, or symbolic methods to the solution. Include compound interest, exponential growth and decay, and direct and inverse variation problems.		A-REI.17. Graph the solution set of a system of linear inequalities in two variables. A-REI.18. In modeling situations, represent constraints by systems of equations and/or inequalities, and interpret solutions of these systems as viable or non-viable options in the modeling context	
	AII.P.11. Recognize translations and scale changes of a given function f(x) resulting from substitutions for the various parameters a, b, c, and d in y = a f(b(x + c/b)) + d. In particular, describe qualitatively the effect of such changes on polynomial, rational, exponential, and logarithmic functions.			
	AII.P.12. Simplify rational expressions. Solve rational equations and inequalities.		8-EE.2. Solve linear equations with rational number coefficients, including equations that require expanding expressions using the distributive law and collecting like terms	

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			7-EE.3. Choose variables to represent quantities in a word problem, and construct simple equations to solve the problem by reasoning about the quantities c. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, P + 0.05P = 1.05P means that "increase by 5%" is the same as "multiply by 1.05."	
Geometry Indicators				
	AII.G.1. Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems.			
	AII.G.2. Explain the identity $\sin^2\theta + \cos^2\theta = 1$. Relate the identity to the Pythagorean theorem.			
	AII.G.3. Relate geometric and algebraic representations of lines and simple curves.			
Data Analysis, Statistics, and Probability				
	AII.D.1. Select an appropriate graphical representation for a set of data and use appropriate statistics (e.g., quartile or percentile distribution) to communicate information about the data, including box plots.		S-SI.5. Compare data on two or more count or measurement variables by using plots on the real number line (dot plots, histograms, and box plots). Use statistics appropriate to the shape of the data distribution to summarize center (median, mean) and spread (interquartile range, standard deviation) of the data sets. Interpret changes in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	
	AII.D.2. Use combinatorics (e.g., fundamental counting principle, permutations, and combinations) to solve problems, including computing		S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems	

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	geometric probabilities and probabilities of compound events.			
Probability and Statistics				
	PS.1. Demonstrate understanding of the definition of the notion of independent events and use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces.		S-PM.1. Understand that in a probability model, individual outcomes have probabilities that sum to 1. When outcomes are categorized, the probability of a given type of outcome is the sum of the probabilities of all the individual outcomes of that type. S-IPM.2. Understand that when two probability models are combined independently, the probability that one type of outcome in the first model occurs together with another type of outcome in the second model is the product of the two corresponding probabilities in the original models (the Multiplication Rule). S-CP.6. Apply concepts such as intersections, unions and complements of events, and conditional probability and independence to define or analyze events, calculate probabilities and solve problems	
	PS.2. Know the definition of conditional probability, and use it to solve for probabilities in finite sample spaces.		S-CP.2. Understand that if A and B are two events, then in a uniform model the conditional probability of A given B, denoted by P(A□B), is the fraction of B's sample points that also lie in A S-CP.5. Use the laws of probability to compute probabilities	
	PS.3. Demonstrate understanding of the notion of discrete random variables by using them to solve for the probabilities of outcomes (e.g., the probability of the occurrences of five heads in 14 coin tosses).		S-IPM.1. Understand that to describe a pair of random processes (such as tossing a coin and rolling a number cube), or one random process repeated twice (such as randomly selecting a student in the class on two different days), two probability models can be combined into a single model	
	PS.4. Apply uniform, normal, and binomial distributions to the solutions of problems.		S-PM.5. Use a uniform probability model to compute probabilities for a process involving uncertainty, including the random	

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			selection of a person from a population and physical situations where symmetry suggests that different individual outcomes are equally likely. a. List the individual outcomes to create a sample space. b. Label the individual outcomes in the sample space to reflect important characteristics or quantities associated with them. c. Determine probabilities of individual outcomes, and determine the probability of a type or category of outcome as the fraction of individual outcomes it includes. S-IPM.3. Combine two uniform models independently to compute probabilities for a pair of random processes (e.g., flipping a coin twice, selecting one person from each of two classes). a. Use organized lists, tables and tree diagrams to represent the combined sample space. b. Determine probabilities of ordered pairs in the combined model, and determine the probability of a particular type or category of outcomes in the combined model, as the fraction of ordered pairs corresponding to it.	
	PS.5. Determine the mean and the standard deviation of a normally distributed random variable.		S-ES.5. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve	
	PS.6. Know the definitions of the mean,		7-SP.4. Understand the importance of	

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	median, and mode of a distribution of data, and compute each in particular situations.		measures of variation in sample quantities (like means or proportions) in reasoning about how well a sample quantity estimates or predicts the corresponding population quantity.	
	PS.7. Describe a set of frequency distribution data by spread (variance and standard deviation), skewness, symmetry, number of modes, or other characteristics. Use these concepts in everyday applications.		S-SI.5. Compare data on two or more count or measurement variables by using plots on the real number line (dot plots, histograms, and box plots). Use statistics appropriate to the shape of the data distribution to summarize center (median, mean) and spread (interquartile range, standard deviation) of the data sets. Interpret changes in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers)	
	PS.8. Organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem-and-leaf displays, scatter plots, and box-and-whisker plots.		S-SI.4. Summarize comparative or bivariate categorical data in two-way frequency tables. Interpret joint, marginal and conditional relative frequencies in the context of the data, recognizing possible associations and trends in bivariate categorical data. S-SI.5. Compare data on two or more count or measurement variables by using plots on the real number line (dot plots, histograms, and box plots). Use statistics appropriate to the shape of the data distribution to summarize center (median, mean) and spread (interquartile range, standard deviation) of the data sets. Interpret changes in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S-SI.6. Represent bivariate quantitative data on a scatter plot and describe how the variables are related	

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	PS.9. Describe and explain how the relative sizes of a sample and the population affect the validity of predictions from a set of data.		S-IC.2. Understand that the design of an experiment or sample survey is of critical importance to analyzing the data and drawing conclusions S-ES.2. Understand that the probability of an outcome can be interpreted as an assertion about the long-run proportion of the outcome's occurrence if the random experiment is repeated a large number of times	
	PS.10. Approximate a line of best fit (trend line) given a set of data (e.g., scatter plot).		S-SI.7. Fit a linear function for scatter plots that suggest a linear association. Informally assess the fit of the model function by plotting and analyzing residuals. S-SI.8. Use a model function fitted to the data to solve problems in the context of the data, interpreting the slope (rate of change) and the intercept (constant term). S-SI.9. Compute (using technology) and interpret the correlation coefficient for a linear relationship between variables.	
Precalculus and Trigonometry				
Number Sense				
	PCT.N.1. Define and conduct operations on complex numbers, in particular, addition, subtraction, multiplication, and division. Relate the system of complex numbers to the systems of real and rational numbers.		N-CN.3. STEM Understand that complex numbers can be visualized on the complex plane. Real numbers correspond to points on the horizontal (real) axis, and imaginary numbers to points on the vertical axis N-CN.6. Add, subtract, and multiply complex numbers	
	PCT.N.2. Plot complex numbers using both rectangular and polar coordinates systems. Represent complex numbers using polar coordinates, i.e., $a + bi = r(\cos\theta + i\sin\theta)$.		N-CN.9. STEM Graph complex numbers in rectangular form. N-CN.10. STEM Graph complex numbers in polar form and interpret arithmetic operations on complex numbers geometrically. N-CN.11. STEM Explain why the rectangular and polar forms of a complex number represent the same number.	

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	DC Math Standards		Common Core Standards	Comments
	PCT.N.3. Apply DeMoivre's theorem to multiply, take roots, and raise complex numbers to a power.			
Patterns, Relations, and Algebra				
	PCT.P.1. Relate the number of roots of a polynomial to its degree. Solve quadratic equations with complex coefficients, including use of completing the square.			
	PCT.P.2. Demonstrate an understanding of the trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent). Relate the functions to their geometric definitions.		F-TF.1. STEM Understand that the unit circle in the coordinate plane enables one to define the sine, cosine, and tangent functions for real numbers. F-TF.2. STEM Understand that trigonometric functions are periodic by definition, and sums and products of functions with the same period are periodic. F-TF.3. STEM Understand that restricting trigonometric functions to a domain on which they are always increasing or always decreasing allows for the construction of an inverse function. F-TF.4. STEM Revisit trigonometric functions and their graphs in terms of radians	
	PCT.P.3. Use matrices to solve systems of linear equations. Apply to the solution of everyday problems.		N-VM.6. STEM Understand that matrices can be multiplied by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. Matrices of the same dimensions can be added or subtracted. Matrices with compatible dimensions can be multiplied. Unlike multiplication of numbers, matrix multiplication is not a commutative operation, but still satisfies the associative and distributive laws. N-VM.13. STEM Add, subtract, and multiply matrices of appropriate dimensions. N-VM.14. STEM Use matrices to store and	

High School				
	DC Math Standards		Common Core Standards	Comments
			manipulate data, e.g., to represent payoffs or incidence relationships in a network. N-VM.15. STEM Represent systems of linear equations as matrix equations	
	PCT.P.4. Given algebraic, numeric, and/or graphical representations, recognize functions as polynomial, rational, logarithmic, or exponential.		A-REI.20. STEM Relate the properties of logarithms to the laws of exponents and solve equations involving exponential functions F-IF.10. Use technology to exhibit the effects of parameter changes on the graphs of linear, power, quadratic, square root, cube root, and polynomial functions, and simple rational, exponential, logarithmic, sine, cosine, absolute value, and step functions F-BF.6. Solve problems involving linear, quadratic, and exponential functions F-LQE.8. Understand that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function F-LQE.15. Recognize a quantitative relationship as linear, exponential, or neither from description of a situation. F-LQE.16. Compare quantities increasing exponentially to quantities increasing linearly or as a polynomial function	
	PCT.P.5. Combine functions by composition, as well as by addition, subtraction, multiplication, and division.		A-BF.10. STEM Evaluate composite functions and compose functions symbolically	
	PCT.P.6. Identify whether a function has an inverse and when functions are inverses of each other; explain why the graph of a function and its inverse are reflections of one another over the line y = x.		A-BF.11. STEM Read values of an inverse function from a graph or a table, given that the function has an inverse. A-BF.12. STEM For linear or simple exponential functions, find a formula for an inverse function by solving an equation	
	PCT.P.7. Identify maximum and minimum values of functions. Apply to the solution		A-LQE.2. Understand that quadratic functions have maximum or minimum	

High School				
	DC Math Standards		Common Core Standards	Comments
	of problems.		values and can be used to model problems with optimum solutions	
	PCT.P.8. Describe the translations and scale changes of a given function f(x) resulting from substitutions for the various parameters a, b, c, and d in y = a f(b(x + c/b)) + d. In particular, describe the effect of such changes on polynomial, rational, exponential, and logarithmic functions.			
	PCT.P.9. Derive and apply basic trigonometric identities (e.g., $\sin^2\theta + \cos^2\theta = 1$, $\tan^2\theta + 1 = \sec^2\theta$) and the laws of sines and cosines.		F-TF.1. STEM Understand that the unit circle in the coordinate plane enables one to define the sine, cosine, and tangent functions for real numbers. F-TF.2. STEM Understand that trigonometric functions are periodic by definition, and sums and products of functions with the same period are periodic	
	PCT.P.10. Demonstrate an understanding of the formulas for the sine and cosine of the sum or the difference of two angles. Relate the formulas to DeMoivre's theorem and use them to prove other trigonometric identities. Apply to the solution of problems.		G-TGT.2. STEM Understand that the Law of Cosines generalizes the Pythagorean Theorem. G-TGT.3. STEM Understand that the sine, cosine and tangent of the sum or difference of two angles can be expressed in terms of sine, cosine, and tangent of the angles themselves using the addition formulas	
	PCT.P.11. Understand, predict, and interpret the effects of the parameters a, ω, b, and c on the graph of y = asin(ω (x – b)) + c; do the same for the cosine and tangent. Use to model periodic processes.			
	PCT.P.12. Translate among geometric, algebraic, and parametric representations of curves. Apply to the solution of problems.			
	PCT.P.13. Relate the slope of a tangent line at a specific point on a curve to the instantaneous rate of change. Explain the			

High School				
	DC Math Standards		Common Core Standards	Comments
	significance of a horizontal tangent line. Apply these concepts to the solution of problems.			
	PCT.P.14. Approximate areas under a curve.			
	PCT.P.15. Demonstrate an understanding of the binomial theorem and use it in the solution of problems.		A-APR.4. STEM Understand that the Binomial Theorem gives the expansion of (x + a)n in powers of x for a positive integer n and a real number a, with coefficients determined for example by Pascal's Triangle. The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument	
	PCT.P.16. Identify maximum and minimum values of functions in simple situations. Apply to the solution of problems.		F-LQE.2. Understand that quadratic functions have maximum or minimum values and can be used to model problems with optimum solutions	
Geometry				
	PCT.G.1. Demonstrate an understanding of the laws of sines and cosines. Use the laws to solve for the unknown sides or angles in triangles. Determine the area of a triangle given the length of two adjacent sides and the measure of the included angle.		G-TGT.2. STEM Understand that the Law of Cosines generalizes the Pythagorean Theorem G-TGT.4. STEM Understand that the Laws of Sines and Cosines embody the triangle congruence criteria, in that three pieces of information are usually sufficient to completely solve a triangle. Furthermore, these laws yield two possible solutions in the ambiguous case, illustrating that "Side-Side-Angle" is not a congruence criterion	
	PCT.G.2. Use vectors to solve problems. Describe addition of vectors, multiplication of a vector by a scalar, and the dot product of two vectors, both symbolically and geometrically. Use vector methods to obtain geometric results.		N-VM.1. STEM Understand that vector quantities have both magnitude and direction. Vector quantities are typically represented by directed line segments. The magnitude of a vector **v** is commonly denoted $\lvert\mathbf{v}\rvert$ or $\lVert\mathbf{v}\rVert$. N-VM.2. STEM Understand that vectors are determined by the coordinates of their initial and terminal points, or by their components.	

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	DC Math Standards		Common Core Standards	Comments
			N-VM.3. STEM Understand that vectors can be added end-to-end, component-wise, or by the parallelogram rule. The magnitude of a sum of two vectors is typically not the sum of the magnitudes. N-VM.4. STEM Understand that a vector **v** can be multiplied by a real number c (called a scalar in this context) to form a new vector c**v** with magnitude |c|v. When |c|v ≠ 0, the direction of c**v** is either along **v** (for c > 0) or against **v** (for c < 0). Scalar multiplication can be shown graphically by scaling vectors and possibly reflecting them in the origin; scalar multiplication can also be performed component-wise, e.g., as c(vx, vy) = (cvx, cvy). N-VM.5. STEM Understand that vector subtraction **v** – **w** is defined as **v** + (–**w**). Two vectors can be subtracted graphically by connecting the tips in the appropriate order	
	PCT.G.3. Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.			
Measurement				
	PCT.M.1. Describe the relationship between degree and radian measures, and use radian measure in the solution of problems, particularly problems involving angular velocity and acceleration.			
	PCT.M.2. Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.			
Data Analysis, Statistics, and Probability				
	PCT.D.1. Design surveys and apply random sampling techniques to avoid bias in the data collection.		S-IC.2. Understand that the design of an experiment or sample survey is of critical importance to analyzing the data and drawing conclusions S-IC.5. Recognize the purposes of and	

High School				
	DC Math Standards		Common Core Standards	Comments
			differences among sample surveys, experiments and observational studies; explain how randomization relates to each. S-IC.6. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. S-IC.7. Use data from a randomized experiment to compare two treatments; justify significant differences between parameters through the use of simulation models for random assignment	
	PCT.D.2. Apply regression results and curve fitting to make predictions from data and select appropriate functions as models.			
	PCT.D.3. Compare the results of simulations (e.g., random number tables, random functions, and area models) with predicted probabilities.		S-ES.4. Compare the results of simulations with predicted probabilities. When there are substantial discrepancies between predicted and observed probabilities, explain them.	

The following standards are located in the Common Core Standards for Mathematics but do not have a collating DC standard.

	DC Math Standards		Common Core Standards	Comments
Algebra				
			A-SSE.1. Understand that different forms of an expression may reveal different properties of the quantity in question; a purpose in transforming expressions is to find those properties. *Examples: factoring a quadratic expression reveals the zeros of the function it defines, and putting the expression in vertex form reveals its maximum or minimum value; the expression* 1.15*t can be rewritten as* (1.151/12)12*t* ≈ 1.01212*t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*	
			A-SSE.2. Understand that complicated expressions can be interpreted by viewing one or more of their parts as single entities.	
			A-SSE.3. Interpret an expression that represents a quantity in terms of the context. *Include interpreting parts of an expression, such as terms, factors and coefficients.*	
			A-SSE.4. Factor, expand, and complete the square in quadratic expressions.	
			A-SSE.5. See expressions in different ways that suggest ways of transforming them. *For example, see* $x4 – y4$ as $(x2)2 – (y2)2$, *thus recognizing it as a difference of squares that can be factored as* $(x2 – y2)(x2 + y2)$.	
			A-SSE.6. Rewrite expressions using the laws of exponents. *For example, (x1/2)3 = x3/2 and 1/x = x–1.*	
			A-SSE.8. STEM Prove the formula for the sum of a geometric series, and use the formula to solve problems.	
			A-APR.1. Understand that polynomials form	

			a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication.	
			A-APR.3. Understand the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x – a$ is $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.	
			A-APR.10. STEM Identify zeros and asymptotes of rational functions, when suitable factorizations are available, and use the zeros and asymptotes to construct a rough graph of the function.	
			A-APR.11. STEM Divide polynomials, using long division for linear divisors and long division or a computer algebra system for higher degree divisors.	
			A-CED.1. Understand that equations in one variable are often created to describe properties of a specific but unknown number.	
			A-CED.2. Understand that equations in two or more variables that represent a relationship between quantities can be built by experimenting with specific numbers in the relationship.	
			A-CED.3. Write equations and inequalities that specify an unknown quantity or to express a relationship between two or more quantities. Use the equations and inequalities to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	
			A-CED.4. Rearrange formulas to highlight a quantity of interest. *For example, transform Ohm's law V = IR to highlight resistance R; in motion with constant acceleration, transform vf,x2 – vi,x2 =*	

			2*ax*(*xf – xi*) *to highlight the change in position along the x-axis*, *xf – xi*.	
			A-REI.1. Understand that to solve an equation algebraically, one makes logical deductions from the equality asserted by the equation, often in steps that replace it with a simpler equation whose solutions include the solutions of the original one.	
			A-REI.3. Understand that given a system of two linear equations in two variables, adding a multiple of one equation to another produces a system with the same solutions. This principle, combined with principles already encountered with equations in one variable, allows for the simplification of systems.	
			A-REI.4. Understand that the graph of an equation in two variables is the set of its solutions plotted in the coordinate plane, often forming a curve or a line.	
			A-REI.5. Understand that solutions to two equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.	
			A-REI.6. Understand that the solutions to a linear inequality in two variables can be graphed as a half-plane (excluding the boundary in the case of a strict inequality).	
			A-REI.7. Understand that solutions to several linear inequalities in two variables correspond to points in the intersection of the regions in the plane defined by the solutions to the inequalities.	
			A-REI.9. STEM Understand that the relationship between an invertible function *f* and its inverse function can be used to solve equations of the form *f*(*x*) = *c.*	
			A-REI.10. Solve simple rational and radical equations in one variable, noting and	

			explaining extraneous solutions.	
			A-REI.11. Solve linear equations in one variable, including equations with coefficients represented by letters.	
			A-REI.13. Solve equations $f(x) = g(x)$ approximately by finding the intersections of the graphs of $f(x)$ and $g(x)$, e.g. using technology to graph the functions. *Include cases where f(x) and/or g(x) are linear, polynomial, rational, exponential, and logarithmic functions.*	
			A-REI.14. Solve linear inequalities in one variable and graph the solution set on a number line.	
			A-REI.16. Solve algebraically a simple system consisting of one linear equation and one quadratic equation in two variables; for example, find points of intersection between the line $y = –3x$ and the circle $x2 + y2 = 3$.	
			A-REI.21. STEM Use inverse functions to solve equations of the form $a \sin(bx + c) = d$, $a \cos(bx + c) = d$, and $a \tan(bx + c) = d$.	
Functions				
			F-IF.2. Understand that functions of a single variable have key characteristics, including: zeros; extreme values; average rates of change (over intervals); intervals of increasing, decreasing and/or constant behavior; and end behavior.	
			F-IF.11. Transform quadratic polynomials algebraically to reveal different features of the function they define, such as zeros, extreme values, and symmetry of the graph.	
			F-BF.2. Understand that sequences are functions whose domain is a subset of the nonnegative integers.	
			F-BF.3. STEM Understand that composing a	

			function *f* with a function *g* creates a new function called the composite function—for an input number *x*, the output of the composite function is *f*(*g*(*x*)).	
			F-BF.4. STEM Understand that the inverse of an invertible function —undoes what the function does; that is, composing the function with its inverse in either order returns the original input. One can sometimes produce an invertible function from a non-invertible function by restricting the domain (e.g., squaring is not an invertible function on the real numbers, but squaring is invertible on the nonnegative real numbers).	
			F-BF.5. Write a function that describes a relationship between two quantities, for example by varying parameters in and combining standard function types (such as linear, quadratic or exponential functions). Use technology to experiment with parameters and to illustrate an explanation of the behavior of the function when parameters vary.	
			F-BF.7. Identify the effect on the graph of replacing *f*(*x*) by *f*(*x*) + *k*, *k f*(*x*), *f*(*kx*), and *f*(*x* + *k*) for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.	
			F-BF.8. Generate an arithmetic or geometric sequence given a recursive rule for the sequence.	
			F-BF.9. As a way to describe routine modeling situations, write arithmetic and geometric sequences both recursively and in closed form, and translate between the two forms.	
			F-LQE.4. Understand that linear functions	

			grow by equal differences over equal intervals; exponential functions grow by equal factors over equal intervals.	
			F-LQE.5. Understand that in an arithmetic sequence, differences between consecutive terms form a constant sequence, and second differences are zero. Conversely, if the second differences are zero, the sequence is arithmetic. Arithmetic sequences can be seen as linear functions.	
			F-LQE.6. Understand that in a sequence that increases quadratically (e.g., $an = 3n2 + 2n + 1$), differences between consecutive terms form an arithmetic sequence, and second differences form a constant sequence. Conversely, if the second differences form a constant sequence with nonzero value, the sequence increases quadratically.	
			F-LQE.7. Understand that in a geometric sequence, ratios of consecutive terms are all the same.	
			F-LQE.9. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	
			F-LQE.10. Construct a function to describe a linear relationship between two quantities. Determine the rate of change and constant term of a linear function from a graph, a description of a relationship, or from two (x, y) values (include reading these from a table).	
			F-LQE.11. Use quadratic functions to model problems, e.g., in situations with optimum solutions.	
			F-LQE.12. Construct an exponential function in the form $f(x) = a(1 + r)x$ or $f(x) = abx$ to describe a relationship in which one	

			quantity grows with respect to another at a constant percent growth rate or a with a constant growth factor.	
			F-LQE.13. Interpret the rate of change and constant term of a linear function or sequence in terms of the situation it models, and in terms of its graph or a table of values.	
			F-LQE.14. Calculate and interpret the growth factor for an exponential function (presented symbolically or as a table) given a fixed interval. Estimate the growth factor from a graph.	
			F-TF.5. STEM Use the unit circle to determine geometrically the values of sine, cosine, tangent for integer multiples of π/4 and π/6.	
			F-TF.6. STEM Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.	
			F-TF.7. STEM Solve simple trigonometric equations formally using inverse trigonometric functions and evaluate the solutions numerically using technology. *Solving trigonometric equations by means of the quadratic formula is optional.*	
Geometry				
			G-CO.1. Understand that two geometric figures are congruent if there is a sequence of rigid motions (rotations, reflections, translations) that carries one onto the other. This is the principle of superposition.	
			G-CO.5. Know and use (in reasoning and problem solving) definitions of angles, polygons, parallel, and perpendicular lines, rigid motions, parallelograms and rectangles.	
			G-SRT.1. Understand that dilating a line produces a line parallel to the original. (In	

			particular, lines passing through the center of the dilation remain unchanged.)	
			G-SRT.4. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of sine, cosine, and tangent.	
			G-SRT.9. STEM Give an informal explanation using successive approximation that a dilation of scale factor *r* changes the length of a curve by a factor of *r* and the area of a region by a factor of *r*2.	
			G-C.1. Understand that dilations can be used to show that all circles are similar.	
			G-C.2. Understand that there is a unique circle through three non-collinear points, and four circles tangent to three non-concurrent lines.	
			G-C.4. Identify and describe relationships among angles, radii, and chords. *Include the relationship between central, inscribed and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*	
			G-GPE.2. Understand that the equation of a circle can be found using its definition and the Pythagorean Theorem.	
			G-GPE.3. Understand that transforming the graph of an equation by reflecting in the axes, translating parallel to the axes, or applying a dilation in one of the coordinate directions corresponds to substitutions in the equation.	
			G-GPE.4. STEM Understand that an ellipse is the set of all points whose distances from two fixed points (the foci) are a constant sum. The graph of *x*2/*a*2 + *y*2/*b*2 = 1 is an ellipse with foci on one of the axes.	
			G-GPE.5. STEM Understand that a parabola	

			is the set of points equidistant from a fixed point (the focus) and a fixed line (the directrix). The graph of any quadratic function is a parabola, and all parabolas are similar.	
			G-GPE.6. STEM Understand that the formula $A = \pi ab$ for the area of an ellipse can be derived from the formula for the area of a circle.	
			G-GPE.8. Find the point on the segment between two given points that divides the segment in a given ratio.	
			G-GPE.9. Use coordinates to compute perimeters of polygons and areas for triangles and rectangles, e.g. using the distance formula.	
			G-GPE.10.Decide whether a point with given coordinates lies on a circle defined by a given equation.	
			G-GPE.11.Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).	
			G-GPE.12. Complete the square to find the center and radius of a circle given by an equation.	
			G-GPE.13. STEM Find an equation for an ellipse given in the coordinate plane with major and minor axes parallel to the coordinate axes.	
			G-GPE.14. STEM Calculate areas of ellipses to solve problems.	
			G-TGT.1. STEM Understand that the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle can be derived by drawing an	

			auxiliary line from a vertex perpendicular to the opposite side. Applying this formula in three different ways leads to the Law of Sines.	
			G-TGT.5. STEM Explain proofs of the Law of Sines and the Law of Cosines.	
			G-TGT.6. STEM Use the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	
			G-GMD.1. Understand that the area of a decomposed figure is the sum of the areas of its components and is independent of the choice of dissection.	
			G-GMD.2. STEM Understand that lengths of curves and areas of curved regions can be defined using the informal notion of limit.	
			G-GMD.3. STEM Understand that Cavalieri‘s principle allows one to understand volume formulas informally by visualizing volumes as stacks of thin slices.	
			G-GMD.4. Find areas of polygons by dissecting them into triangles.	
			G-GMD.5. Explain why the volume of a cylinder is the area of the base times the height, using informal arguments.	
			G-GMD.6. For a pyramid or a cone, give a heuristic argument to show why its volume is one-third of its height times the area of its base.	
			G-GMD.7. Apply formulas and solve problems involving volume and surface area of right prisms, right circular cylinders, right pyramids, cones, spheres and composite figures.	
			G-GMD.8. STEM Identify cross-sectional shapes of slices of three-dimensional objects, and identify three-dimensional	

			objects generated by rotations of two-dimensional objects.	
			G-GMD.9. STEM Use the behavior of length and area under dilations to show that the circumference of a circle is proportional to the radius and the area of a circle is proportional to the square of the radius. Identify the relation between the constants of proportionality with an informal argument involving dissection and recomposition of a circle into an approximate rectangle.	
			G-MG.1. Understand that models of objects and structures can be built from a library of standard shapes; a single kind of shape can model seemingly different objects.	
			G-MG.2. Use geometric shapes, their measures and their properties to describe objects (e.g., modeling a tree trunk or a human torso or as a cylinder).	
			G-MG.3. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	
			G-MG.4. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy constraints or minimize cost; working with typographic grid systems based on ratios)	
Number and Quantity				
			N-RN.1. Understand that the laws of exponents for positive integer exponents follow from an understanding of exponents as indicating repeated multiplication, and from the associative law for multiplication.	
			N-RN.3. Understand that sums and products of rational numbers are rational.	
			N-RN.5. Rewrite expressions using the laws of exponents. *For example,* (51/2)3 = 53/2 *and* 1/5 = 5–1.	

			N-Q.1. Understand that the magnitude of a quantity is independent of the unit used to measure it. *For example, the density of a liquid does not change when it is measured in another unit. Rather, its measure changes. The chosen unit "measures" the quantity by giving it a numerical value ("the density of lead is 11.3 times that of water").*	
			N-Q.2. Use units as a way to understand problems and to guide the solution of multi-step problems, involving, e.g., acceleration, currency conversions, derived quantities such as person-hours and heating degree days, social science rates such as per-capita income, and rates in everyday life such as points scored per game.	
			N-Q.3. Define metrics for the purpose of descriptive modeling. *For example, find a good measure of overall highway safety; propose and debate measures such as fatalities per year, fatalities per year per driver, or fatalities per vehicle-mile traveled.*	
			N-Q.4. Add, subtract, multiply, and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	
			N-Q.6. Use and interpret quantities and units correctly in graphs and data displays (function graphs, data tables, scatter plots, and other visual displays of quantitative information). Generate graphs and data displays using technology.	
			N-CN.4. STEM Understand that on the	

			complex plane, arithmetic of complex numbers can be interpreted geometrically: addition is analogous to vector addition, and multiplication can be understood as rotation and dilation about the origin. Complex conjugation is reflection across the real axis.	
			N-CN.7. STEM Find the conjugate of a complex number; use conjugates to find absolute values and quotients of complex numbers.	
			N-CN.8. STEM Solve quadratic equations with real coefficients that have complex solutions using a variety of methods.	
			N-VM.7. STEM Understand that a vector, when regarded as a matrix with one column, can be multiplied by a matrix of suitable dimensions to produce another vector. A 2 x 2 matrix can be viewed as a transformation of the plane.	
			N-VM.8. STEM Understand that a system of linear equations can be represented as a single matrix equation in a vector variable.	
			N-VM.9. STEM Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.	
			N-VM.10. STEM Perform basic vector operations (addition, subtraction, scalar multiplication) both graphically and algebraically.	
			N-VM.11. STEM Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.	
			N-VM.12. STEM Solve problems involving velocity and quantities that can be	

			represented by vectors.	
			N-VM.16. STEM Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension greater than 3 x 3).	
Statistics and Probability				
			S-SI.1. Understand that statistical methods take variability into account to support making informed decisions based on data collected to answer specific questions.	
			S-SI.2. Understand that visual displays and summary statistics condense the information in data sets into usable knowledge.	
			S-SI.3. Understand that patterns of association or relationships between variables may emerge through careful analysis of multi-variable data.	
			S-SI.6. Represent bivariate quantitative data on a scatter plot and describe how the variables are related.	
			S-SI.10. Distinguish between correlation and causation.	
			S-PM.2. Understand that uniform probability models are useful models for processes such as (i) the selection of a person from a population; (ii) the selection of a number in a lottery; (iii) any physical situation in which symmetry suggests that different individual outcomes are equally likely.	
			S-PM.3. Understand that two different empirical probability models for the same process will rarely assign exactly the same probability to a given type of outcome. But if the data sets are large and the methods used to collect the data for the two data sets are consistent, the agreement between the models is likely to be reasonably good.	

			S-PM.4. Understand that a (theoretical) uniform probability model may be judged by comparing it to an empirical probability model for the same process. If the theoretical assumptions are appropriate and the data set is large, then the two models should agree approximately. If the agreement is not good, then it may be necessary to modify the assumptions underlying the theoretical model or look for factors that might have affected the data used to create the empirical model.	
			a. List the individual outcomes to create a sample space.	
			b. Label the individual outcomes in the sample space to reflect important characteristics or quantities associated with them.	
			c. Determine probabilities of individual outcomes, and determine the probability of a type or category of outcome as the fraction of individual outcomes it includes.	
			S.PM.6. Generate data by sampling, repeated experimental trials, and simulations. Record and appropriately label such data, and use them to construct an empirical probability model. Compute probabilities in such models.	
			S-PM.7. Compare probabilities from a theoretical model to probabilities from a corresponding empirical model for the same situation. If the agreement is not good, explain possible sources of the discrepancies.	
			S-IPM.4. For two independently combined uniform models, use the Multiplication Rule to determine probabilities.	
			S-IC.1. Understand that statistics is a process for making inferences about population parameters based on a sample	

			from that population; randomness is the foundation for statistical inference.	
			S-IC.3. Understand that simulation-based techniques are powerful tools for making inferences and justifying conclusions from data.	
			S-IC.4. Use probabilistic reasoning to decide if a specified model is consistent with results from a given data-generating process. (For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?)	
			S-IC.8. Evaluate reports based on data.	
			S-CP.7. Construct and interpret two-way tables to show probabilities when two characteristics (or categories) are associated with each sample point. Use a two-way table to determine conditional probabilities.	
			S-CP.8. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.	
			S-MD.1. Understand that the expected value of a random variable is the weighted average of its possible values, with weights given by their respective probabilities.	
			S-MD.2. Understand that when the possible outcomes of a decision can be assigned probabilities and payoff values, the decision can be analyzed as a random variable with an expected value, e.g., of an investment.	
			S-MD.3. Calculate expected value, e.g. to determine the fair price of an investment.	
			S-MD.4. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	

			S-MD.5. Evaluate and compare two investments or strategies with the same expected value, where one investment or strategy is safer than the other.	
			S-MD.6. Evaluate and compare two investments or strategies, where one investment or strategy is safer but has lower expected value. Include large and small investments, and situations with serious consequences.	
			S-MD.7. Analyze decisions and strategies using probability concepts (e.g. product testing, medical testing, pulling a hockey goalie at the end of a game).	